THE

VETERINARY JOURNAL

JULY, 1907.

THE LATE MR. WILLIAM PALLIN, J.P., F.R.C.V.S.

BORN in Dublin on September 26, 1843. Died at 23, Maddox Street, London, June 8, 1907. He was the eldest son of the late Daniel Pallin, of the Little Forrest Swords, co. Dublin. At an early age he was articled as a pupil to the late Mr. John Martin, veterinary surgeon, Dublin. Qualified from the Dick Veterinary College, Edinburgh, in 1863. Became Vice-President of the Royal College of Veterinary Surgeons; Fellow in 1896; and Examiner in Veterinary Hygiene in 1898. He first started practice in Carlow, but at the same time he carried on horse breeding on a small scale, his first stallion being Kinnaird, by Wild Dayrell out of May Day by Venison; later on he sold his practice in Carlow and set up in Kilkenny, where he had already had a branch practice. In 1871 he entered the Army and served with the Artillery until 1873, when he was gazetted to the 20th Hussars, with which regiment he served for over eight years; at the end of the first Boer War he resigned the Service and settled down at Athgarvan Lodge, a beautiful place on the Curragh, co. Kildare, which has been the home of notable sportsmen from the days of the famous Bowes Daly to Allan MacDonagh, in order to devote himself to his favourite study of horse breeding, although for several years after starting the Athgarvan Lodge stud he also did a fair amount of practice; eventually pressure of business made him relinquish this. At the same time, he always kept in touch with veterinary science and the profession generally, being a Life Governor of the Royal Veterinary College of Ireland, a Member of the National Veterinary Association, and also of the Veterinary Medical Association of Ireland. In 1881 he was first represented at the Doncaster Sales by a yearling colt, by Umpire out of Phœbe, and since then has,

year after year, appeared as a seller in the Doncaster sale ring, usually the day after the St. Leger. His young ones are always well bred, have been fairly fortunate in making prices, and have produced a good number of winners. His stud was started with Balfe, whom he leased in 1881 from Prince Soltykoff, and with four mares, collected while soldiering, had gradually developed to its present state of large proportions.

Among the sires who have stood at Athgarvan Lodge are Balfe, Favo (who headed the list of winning sires in Ireland for two or three years), Philamon, Ben Battle, New Holland, Wenlock (winner of the St. Leger), Kingcraft (a Derby winner), Skylark, Beatris, Greenback, Lurgan, Sir Hugo (winner of the Derby), Wiseman, Bunbury, Astrologer, Broxton, The Gull, and Red Prince II. (the most successful weight-carrying thoroughbred sire that has stood in Ireland for many years and winner in 1898, 1900, 1905 and 1906 of the Croker Challenge Cup at the Dublin Horse Show for the best weight-carrying thoroughbred stallion). The use of these sires has, in no small degree, helped to place horse breeding in Ireland in its present position, as one of the leading industries of the country. But Mr. Pallin's interest in sport was not confined to breeding—he hunted continually for forty-three years, and during the land troubles in 1889 he hunted the country successfully with his own harriers. He won the Grand Military Hunt Cup at Sandown in 1877. Ran the Brighton and Arundel Coach, with himself on the box, in 1876, and has often ridden on the flat and over country. The walls of the old Lodge at Athgarvan are hung with some pictures of his favourites, painted by himself, and testify to his skill as an artist, while his collection of portraits of famous horses, more particularly of celebrated sires, is unique and most valuable. He was a prolific writer, and won the Royal Dublin Society prize with his "Essay on Horse Breeding." At the time of his death, was engaged in writing a book on horse breeding, and the treatment of mares and foals, and it is hoped that one of his sons will complete the work which Mr. Pallin has unfortunately been unable to finish.

He was a Justice of the Peace for County Kildare, and also had a seat on Grand Jury. He was a large employer of labour, and his loss to the district and also to the horse-breeding public generally will be keenly felt. He was a most versatile and shrewd business man, and the house property which he has left, designed and built out of bricks which are his own manufacture, bears witness to his abilities as an architect and sound speculator.

Mr. Pallin was married three times and leaves three sons, who are all endowed with the same love of horses and sport as he was himself.

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Editorials.

THE OVERCROWDING (?) OF THE VETERINARY PROFESSION.

THE veterinary profession, like all others, is not without its pessimists, and we are not infrequently subjected to their moanings either by word of mouth or by correspondence. One day the cry is of the motor invasion and the passing of the horse, while another day it is of the overcrowding of the profession. In each case the wailings have usually been of the nature of those made by the "man in the street," who makes commonplace and sweeping statements after a superficial observation, and without having enquired into the details of the subjects of his statements. In a previous issue of the VETERINARY JOURNAL we dealt with the motor subject, and were able to show that things were by no means as black as they had been painted. The recent Horse Show at Olympia has shown that the horse is still very much to the fore, and it has been a very striking illustration, too.

Now, with regard to the other cry of the pessimists to which we referred above, namely, the overcrowding of the profession, we find some rather startling figures furnished by the recent Annual Report of the Royal College of Veterinary Surgeons. On reference to that report, we see that the number of new graduates during the last year (1906-7) reached ninety-two; while on referring to the obituary list, we find the decease recorded of ninety-five veterinary surgeons. In other words, the registered deaths for the year outnumber the new graduates. Of course, that state of affairs must be regarded as unusual. That being the case, we have made enquiries, and find that in the previous year (1905-6) the number of new graduates only exceeded the deaths by five (eighty to seventy-five). The aggregate for the past four years, which we think should furnish a fair basis for generalisations, shows an excess of thirty-four new graduates over deaths (314 to 280), or an average of about eight per year. Those

figures certainly do not support the suggestion of overcrowding, and particularly so when one takes into account the various new channels which are opening up for the exercise of the veterinary surgeon's special abilities, especially municipal inspectorships and the numerous Colonial and Indian appointments. When we review these facts, we are unable to agree with our nervous *confrères*, and we submit that the prospects of the veterinary profession are quite as bright as, if not brighter than, those of any of the other leading professions.

A NEW VETERINARY SURGEONS ACT.

IN this issue we reprint a paper by Mr. F. W. Garnett, that most energetic Member of the Council of the Royal College of Veterinary Surgeons, suggesting and giving reasons for a new Veterinary Surgeons Act. The paper first brings before our notice the various steps which we, as a profession, have taken in arriving at our present legal state since the granting of our first charter in 1844. It next points out various defects which time has shown to exist only too plainly, and then proceeds to suggest methods of correcting those defects. Mr. Garnett is of opinion that the only safe remedy lies in a new Act of Parliament including clauses relating to these points, such as increased powers to deal with infringements of the bye-laws of the Royal College of Veterinary Surgeons by registered practitioners, with veterinary surgeons' companies, power to impose an annual registration fee, inspection of the teaching colleges, exemption from juries, and the question of pupilage. All these points, and probably many others, deserve the very serious consideration of the powers that be, and we fail to see how they can be adequately dealt with by any means less powerful than an Act of Parliament.

We believe that nearly all our readers will agree in the main issue with Mr. Garnett. In the discussion on the paper valuable opinions were expressed by two of the most influential members of the profession, Sir John M'Fadyean and Mr. Hunting, whose sentiments practically coincided with those of Mr. Garnett, except in so far as compulsory pupilage was concerned. While readily

admitting the great advantages of voluntary pupilage, they pointed out the difficulties of any practical scheme making it compulsory. All at the meeting appeared to agree that the income of the Royal College of Veterinary Surgeons must be increased in order that the work of protection of the profession can be more exhaustively carried out, and in order that an appropriate library and museum can be established instead of the apology at present existing. It is obviously undesirable to increase the income from the present sources, mainly examination fees, which are high enough already, and one is driven to consider the only other reasonable source, namely, an annual registration fee, payable by all whose names are on the Register of Veterinary Surgeons. We know of no reasonable objections to such a course, and we have never met with any member of the profession who seriously objected to it. The suggestion appears to meet with almost universal approval, and consequently we submit that it is the duty of the Council of the Royal College of Veterinary Surgeons to take steps in the near future to bring about so desirable an end.

Two very important points in Mr. Garnett's paper were apparently overlooked in the discussion. One referred to the constitution and the method of procedure of the Registration Committee. We certainly agree that some reform in that direction is desirable, and Mr. Garnett's suggestions would appear to meet the case. A judicial committee of five members would be much more workable than an unwieldy committee composed of all the Members of Council. The other point referred to the obtaining of powers to inspect classes held in any affiliated school. The Council possesses powers already to stipulate their requirements with regard to the subjects to be taught and the minimum of time to be devoted to them; but they appear to have no means of ascertaining if the spirit as well as the letter of such requirements is adhered to. We doubt if any of the colleges would object to any reasonable system of inspection; on the contrary, we think they would be more likely to welcome it.

We recommend a careful perusal of Mr. Garnett's paper by all interested in the welfare of the veterinary profession.

Original Articles.

HORSES, ASSES AND ZEBRAS.

BY A. W. NOËL PILLERS, M.R.C.V.S., ROYAL VETERINARY COLLEGE, LONDON.

(Awarded the 1st Prize Medal of the Royal Veterinary College, Veterinary Medical Association, Session 1906.)

At first sight it may appear to you that a paper on this subject is hardly within the limits of our Association, but on consideration I think there are many reasons which will allow of it. In the first place, on purely scientific grounds we should have a good general knowledge of the group, for such would often be of use to us in questions of colouration, hybridism, telegony, &c. Again, in our general study of zoology this group does not occupy as much of our attention as I think it should; again, current literature often makes reference to some members of the group with which we are less well acquainted. There is also a possibility of some of the African species becoming domesticated, and they would then play an important rôle in veterinary surgery in that country. The collection of Equidæ in the British (Natural History) Museum and in the Gardens of the Zoological Society are of such interest that there should be few of us who do not possess some slight knowledge of the group.

Position of the Equidæ in Nature.—With these few remarks we will pass on to a consideration of the position occupied by these animals in nature. The Equidæ are eutherian mammals and belong to the natural order *Ungulata*, characterised by having hoofs at the ends of limbs which are in the main adapted for speed. Most ungulates are terrestrial and adapted for a vegetable diet, as is shown by their large molar teeth, which possess broad crowns with tuberculated or ridged surfaces. From their large size ungulates are a difficult group to study. The next division is into *Ungulata Vera* and *Sub Ungulata*, and the suborder *Perissodactyla* is included in the former of these. Perissodactyles are odd-toed ungulates and the median line of the *manus* or *pes* passes down the third digit, or what in our hand would correspond to the second or big finger. Some of the digits are absent or exist only as vestiges (disused rudiments). The shape and construction of the molar and incisor teeth with which you are acquainted is characteristic.

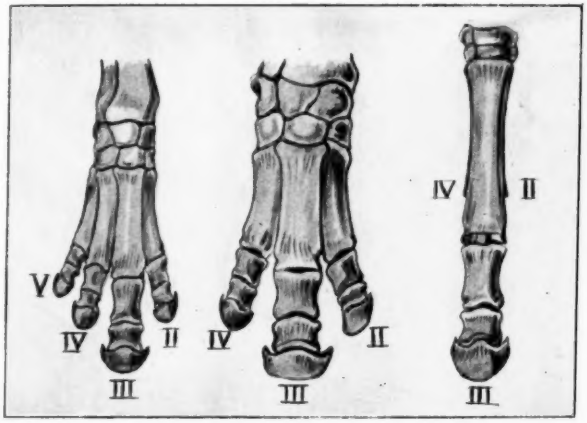
The dental formulæ of the three families of the Perissodactyla are as follows:—

(1) Equidæ ... ... I. $\frac{3}{3}$ C $\frac{1}{1}$ PM $\frac{3}{3}$ M $\frac{3}{3}$.
(2) Tapiridæ ... ... I. $\frac{2}{2}$ C $\frac{1}{1}$ PM $\frac{4}{4}$ M $\frac{3}{3}$.
(3) Rhinocerotidæ ... ... I. $\frac{0-2}{0-1}$ C $\frac{0}{1}$ PM $\frac{4}{4}$ M $\frac{3}{3}$.

Perissodactyles are divided into three families—(1) *Tapiridæ*; (2) *Rhinocerotidæ* and (3) *Equidæ*. This last family is the one which concerns us and is characterised by the great reduction that has taken place in the number of digits. Thus there is only one complete digit, and this is greatly strengthened. Of the second and fourth digits we have the rudimentary metapodials known as splint bones. The general anatomical features of the group, which are well known to you, are, I should say, exactly what an architect would draw up for an animal which had to be speedy, and exist on hard and innutritious food. The

family *Equidæ* to-day contains only one genus, viz., *Equus*, and this includes horses, asses and zebras. Some years ago naturalists recognised three genera, viz., (1) *Equus*; (2) *Asinus*, and (3) *Hippotigris*. It is, however, generally accepted nowadays that the differences existing are not of generic value, although they may still be allowed as group differences, and are as follows :—

(1) *The Zebra Group.*—This group possesses all the characters of the old genus *Hippo tigris* and contains the striped members. As the name denotes, there was in ancient times an idea that these animals were hybrids of the horse and tiger. All this group is found in Africa, and the species have an erect mane with no forelock ; the tail has little long hair at its base ; callosities are present on the fore limbs only ; and the period of gestation appears to be twelve months.



Tapirus. Rhinoceros. Equus.

FIG. 1.—Diagram showing the gradual reduction in the number of digits of the Perissodactyla.

(2) *The Ass Group.*—Previously described as genus *Asinus*, this group contains the asses, which are characterised by their colour being some shade of grey or fawn and with little tendency for irregular markings. The mane is erect and there is no forelock ; the tail has little long hair at the base ; callosities are present on the fore limbs only ; and the period of gestation appears to be twelve months. The feet are narrow and have a contracted appearance, and the lumbar vertebræ are five in number. There are of course many minor differences, such as length of ears, bray, &c., which will be noticed as we come to the several species of this group.

(3) *The Horse Group.*—In the narrowest sense equine characteristics are applied to the horses alone which possess callosities on fore and hind limbs ; the tail is covered with long hair and the period of gestation is eleven months.

Since these three genera have been replaced by one, that of *Equus*, the characters of the above three groups become those of the single genus. The true horses have been brought much closer to the asses

by Prjevalski's horse, which is in many respects quite asinine, and this is one of the reasons in favour of a single genus. The following scheme shows in tabular form what has been said above with regard to the classification of the equidæ.

Horses.

Of what we may term true horses there appears to be several forms, the first division being into northern and southern. In the former we have the dun pony of Norway (*Equus caballus typicus*), and closely allied to this is the Celtic or Western Pony (*E.c. celticus*), and a third form, the wild pony of Mongolia, or Prjevalski's (*E.c. Prjevalskii*). In the southern group we have the barb, arab and thoroughbred &c. (*E.c. asiaticus*).

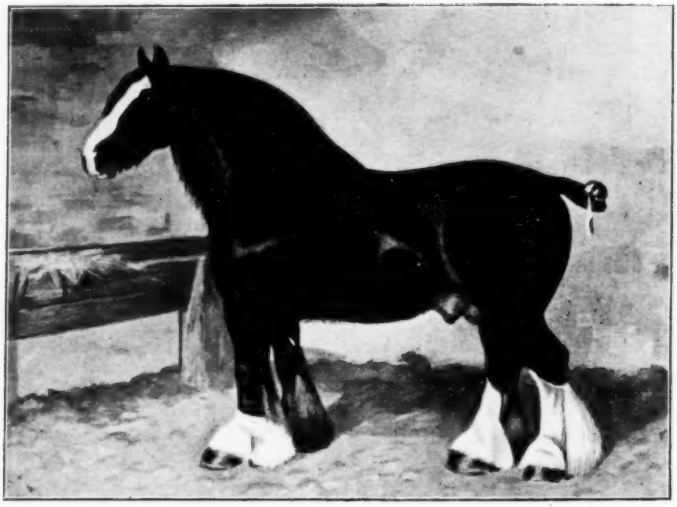
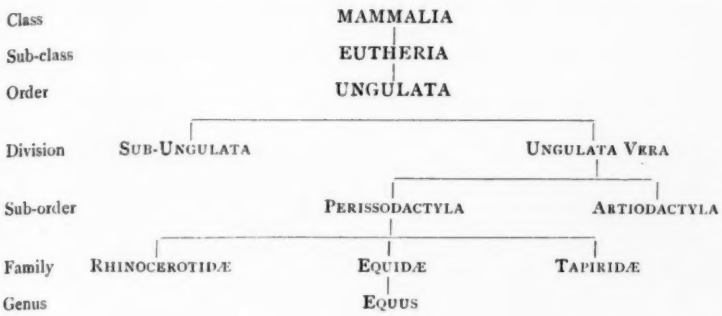


Fig. 2.—A Shire Stallion.

The Domestic Horse.—With regard to this species there is very little to be said, as most of us are well acquainted with its anatomy and chief characteristics. Horses are distinguished from other members of the genus by the tail being covered with long hair from base to tip, the presence of four callosities, a long mane and the presence of a forelock, short ears, and the limbs are longer in proportion to the body. The geographical distribution of the horse of to-day has been largely influenced by man. Long before the historic period they were abundant in Europe, and their remains have been found with those of man in the Neolithic age. Horses were used 2,000 years before the Christian Era. In America it is probable that the present horses were introduced by man, although fossil remains are found in many parts of that continent. It appears that the original stock then died out as a result of specialisation and were re-established by man. Those now appearing wild are



EQUUS

- HORSES
  - NORTHERN
    - The Dun Pony of Norway ... *Equus caballus typicus.*
    - The Celtic or Western Pony ... *Equus caballus celticus.*
    - The Wild Pony of Mongolia, &c. *Equus caballus Prjevalskii.*
  - SOUTHERN
    - The Arab and Thoroughbred, &c. *Equus caballus asiaticus.*
- ASSES
  - AFRICAN
    - The Nubian Ass ... ... *Equus asinus africanus.*
    - The Somali Ass ... ... *Equus asinus somalicus.*
    - The Domestic Ass
  - ASIATIC
    - The Persian Wild Ass ... ... *Equus hemionus onager.*
    - The Indian Wild Ass ... ... *Equus hemionus indicus.*
    - The Tibetan Wild Ass ... *Equus hemionus kiang.*
- ZEBRAS
  - Grevy's Zebra ... ... *Equus Grevyi.*
  - The Mountain Zebra ... ... *Equus zebra.*
  - Ward's Zebra ... ... *Equus Wardi.*
  - BURCHELL'S ZEBRA
    - The Quagga ... . *Equus quagga.*
    - Burchell's Zebra ... ... *Equus quagga Burchelli.*
    - Chapman's Zebra ... ... *Equus quagga Chapmani.*
    - Grant's Zebra ... ... *Equus quagga Granti.*
    - Mashona Race of Burchell's Zebra *Equus quagga Selousi.*
    - Zulu Race of Burchell's Zebra ... *Equus quagga Wahlbergi.*
    - Boehm's Zebra ... ... *Equus quagga Boehmi.*
    - Nyasa Race of Burchell's Zebra ... *Equus quagga Crawshayi.*

really feral. The horse was undoubtedly introduced by man into Australia. It is doubtful if wild horses, in the strict sense, exist at present. The tarpans of the Russian Steppes north of the sea of Azoff have been described as such. They are all dun in colour, small, and have rounded noses. However, I rather think their case is comparable to the forest pigs of New Zealand, which have now become wild, or truly speaking, feral. The varieties or breeds of the domestic horse all offer interesting features in the way of domestication, selection and variation, in the British Isles alone from the Shire to the Shetland, and in other countries the breeds peculiar to them.

The Wild Pony of Mongolia, or, as it is often termed, Prjevalski's horse, aroused much interest about twenty-five years ago. An apparently

new species of horse was presented by Prjevalski to the Zoological Museum of the Imperial Academy of St. Petersburg. It was not captured by him, but he received it as a present from a magistrate of

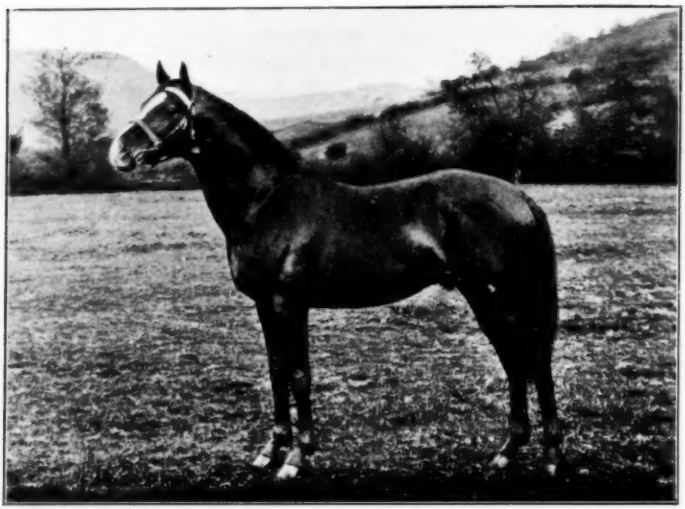


FIG. 3.—A Thoroughbred Polo Pony.

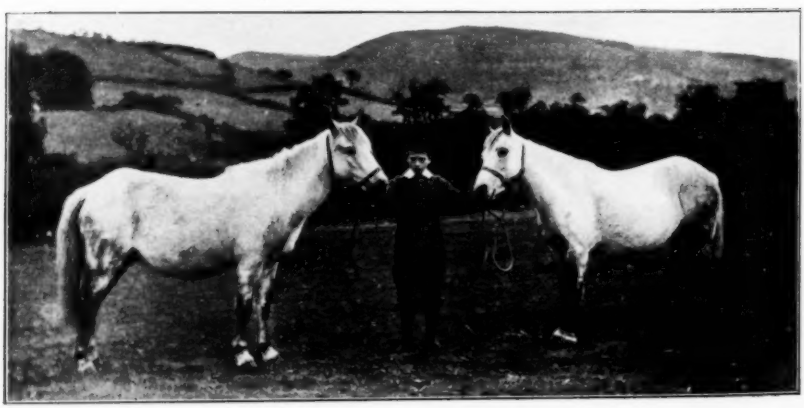


FIG. 4.—Welsh Mountain Ponies.

Zaisan. It was first obtained by camel-hunters in the deserts of Asia. The first description, which was given by Poliakof, appeared in the *Proceedings of the Russian Geographical Society* for 1881. He dis-

tinguished it from the tarpans and called it a distinct species, but recently it has been looked upon as a sub-species of *Equus caballus*. In size it is equal to the ass, but its head is better shaped at the muzzle, and the ears, although not equine, are much shorter. The general conformation resembles the horse but seems to present an asinine appearance to a keen eye. The tail is intermediate between the horse and the ass, having more long hair than the latter, but less than the former. The colour is somewhat of a dun on the back, getting lighter towards the flank, whilst the belly may be nearly white. The head and cheeks are a brick-red colour, and the nose has white hairs on it, which contrast strikingly with the other reddish parts.

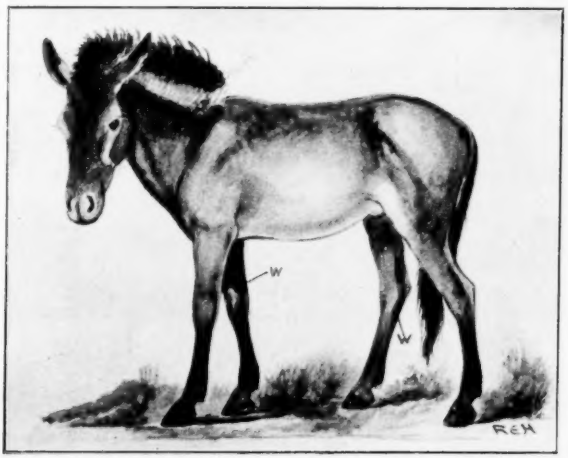


FIG. 5.—The Wild Pony of Mongolia.

The coat is long and rough in winter, but in the summer it is short and darker. There is no forelock, and the mane in summer is erect, although it hangs over in the winter. There is no stripe down the back, and the brown colouration above the hoofs and on the knees is a good point for distinction from the asses. The hoofs and skull are more equine than asinine, although one can easily see resemblance to the latter. Much difference of opinion existed as to the validity of the species, and it was even suggested by some authorities that it was a hybrid, whilst others regarded it as a feral horse, having gained its liberty during some of the great wars. Specimens of this horse have been imported, but as yet little experimental work has been done with them.

The Dun Pony of Norway needs only to be mentioned, but the *Western or Celtic Pony* is interesting from a coloration point of view, as we often see dun animals with a list down the back and a tendency to stripes about the legs. Irish ponies often show these markings, and quite lately I saw a vanner with very clear stripes on the leg. Occasionally one may see horses of this type, with the callosities absent from the hind limbs.

Asses.

The next group to be considered is that of the asses, which is divided primarily into African asses and Asiatic asses, these divisions possessing distinct characters besides those of geographical distribution. African asses are slate-grey in colour, and are (1) the African or Nubian ass (*E. Asinus africanus*), and (2) the Somali ass (*E. a. somalicus*); from these we have obtained the domestic ass. The Asiatic asses are three in number, *viz.*, the Persian wild ass (*E. hemionus onager*) the Indian wild ass (*E. h. Indicus*), and the Tibetan wild ass or Kiang (*E. h. kiang*).

The African Wild Ass exists in the wild state in Abyssinia, Nubia, and other parts of north-east Africa between the Nile and the Red Sea. Its colour and markings need very little comment, as they are very like those of the slate-grey donkey one sees every day. It has a dorsal and a shoulder stripe, but the legs are free from markings. The tail is tufted and the ears, of a dark shade round the edges, are very large.

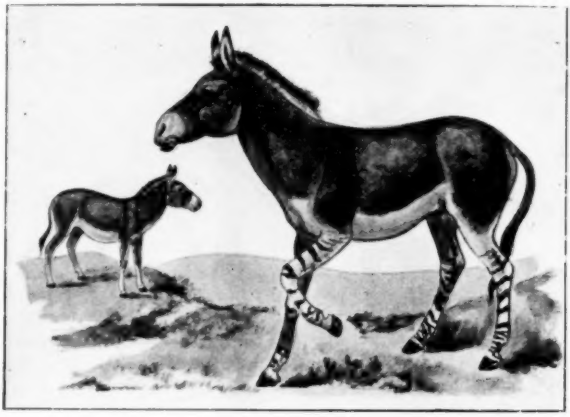


Fig. 6.

The African Ass. The Somali Ass.

There are five lumbar vertebræ, no white markings, and of course no posterior callosities. The thick skin which is found over the loins and the pelvis of the horse is extended over the ribs in the asses. This, however, is not accounted for by the fact of persistent flogging, but perhaps explains why the whip has so little effect on these animals. I believe it is this part of the skin that is used abroad in the manufacture of top boots. There appears to be a great difference in the length of the life of the ass and that of the horse. The ass often attains a very old age. The bray of all the African asses appears to be like that of the domestic ass.

The Somali Wild Ass.—This animal differs from the African ass proper in its greyer colour and the absence of a shoulder stripe. The dorsal stripe is only slightly indicated, and the under parts of the belly are light in colour. The mane is longer and the ears are not so ugly. The legs are striped up to points above the knees and hocks, these

markings tending to encircle the limbs, but in a somewhat irregular manner. Like the various species of giraffe the asses of Africa tend to become more striped as we go farther south, although in the case of the zebras it is interesting to note that this is reversed; the geographical distribution of the asses, however, has not as yet been clearly defined.

The Domestic Ass is in all probability descended from the African asses, but compared with them it shews a very wide range in its coloration, for one can see many gradations between a cream colour and a dirty brown and occasionally shades of rufous tints. There are also leg and dorsal stripes, and, maybe, a shoulder marking. Some individuals may have all of these points while others may possess one or more. There seems to be good reason for believing that the ass has been under domestication for a great time, and the rufous tints often seem to suggest some Asiatic blood, although such colouring may have been obtained by domestication. It is well to mention the range of height of the donkey, say from the costermonger's "Neddy" to the porter Jack, which stands over 14 hands with 8½ in. of bone below the knee. The next groups to be considered are:—

The Asiatic Asses.—It is quite probable that there is only one species of Asiatic ass, so we will first describe the common characters of the species and then mention the three forms as sub-species. The Asiatic ass having such a wide distribution from Syria, through Persia, Afghanistan, the Punjab, and Tibet to the boundaries of China, it is quite easy to recognise the sub-species. Fresh forms are often being described, but I will limit myself to the three mentioned, each of which may now be seen in the gardens of the Zoological Society. These asses are generally seen in herds of thirty or forty, and some travellers say that after foaling time they collect in vast herds. Asiatic asses possess the common characters of asses, but differ from the African species in colour, which is some kind of a rufous-grey, varying from a fawn to a pale chestnut. The under parts of the body are nearly white and there is a dark band down the back instead of the dorsal stripe, and rarely one may see faint indications of a shoulder stripe; leg markings are very rare indeed. The height is between 11 and 12 hands. The bray of this species is more like a shriek. We will consider the three forms of this species in a brief manner.

The Persian Wild Ass, or *Onager.*—Compared with the other members of this species the onager is small. The colour is a mixture of white and fawn, the under surfaces of the body, neck, head, and inside the legs being whitish. The mane is short and dark. The band down the back is composed of fairly long hair, and it broadens out in the lumbar region and is then continued down the tail. One sometimes sees darker markings on the legs, which seem to indicate barring. It is this form which in the north-west of India was said to be able to outstrip the fastest horse and was untameable. However, some time ago an Indian Prince took to riding them down just to disprove this idea, and I believe on one occasion eight were captured without a change of ponies. As regards the "untameable" part of the story some certainly are very vicious, but others are curious and can easily be ridden. This species has been broken in, and many are to be seen in a semi-domestic state at most stations on the Punjab frontier. It is surprising that this ass did not become domesticated in biblical times instead of

the African form, but no doubt this is accounted for by its ferocious tendency, as is also the case with the zebras of Africa, which have been replaced by horses.

The Indian Wild Ass.—Very closely allied to the onager is the Indian wild ass. It is the smallest of the Asiatic asses, the colour is darker, the dorsal band is not so broad, and there is much more mane.

The Tibetan Wild Ass, or *Kiang.*—This is the largest species of the Asiatic asses, the average height being from 13 to 14 hands. The most striking points about it are the well-developed hind limbs and high croup, and the shape of the head, which may be described as Roman-nosed. The colour is a rufous-grey and the dorsal band quite narrow. The voice resembles a neigh to a certain degree. They inhabit rough and desolate places in the region of lakes and rivers in

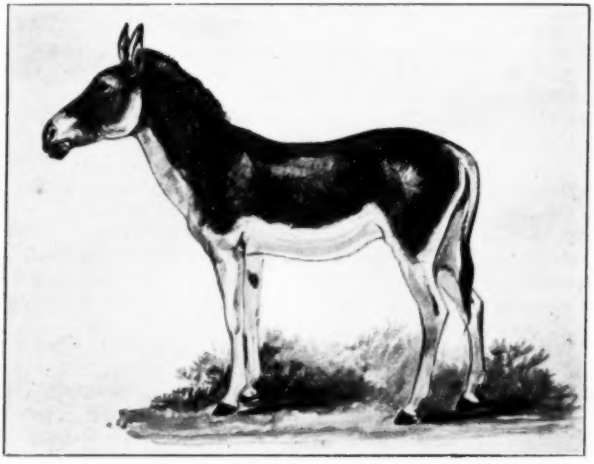


FIG. 7.—The Kiang.

the districts of Tibet towards Lassa, north of the Himalayan Ranges, Salt Lakes Hindustan, and other elevations of 10,000 feet above sea level. I am not aware that this animal has ever been broken in, but accounts mention natives being placed on its back, to which when tired it has shown little objection. The cross of this ass and the horse is highly valued in its native regions. A suggestion was made some years ago that the wild pony of Mongolia was a hybrid of the above animals, but there was very little evidence, and later experiments have quite disproved the idea.

ZEBRAS.

From the asses we pass to the striped horses of Africa, viz., the zebras. The common characters of this group have been previously mentioned. For our purpose I think we may say that there are three distinct species of zebra, but as the different parts of Africa have been opened up to us, it has been necessary to make quite a number of

sub-species in the case of the most common form, viz., Burchell's zebra. These sub-specific distinctions are said to be due to geographical distribution, and that to know a sub-species is to know the region it inhabits. As, however, two forms sometimes come from the same district, I feel that prepotency has a great deal to do with the question. We can often recognize certain young stock as being sired by a certain stallion, and this seems very applicable to some of the sub-species of Burchell's zebra. The three distinct species are (1) Grevy's zebra, (*E. Grevyi*); (2) the mountain zebra (*E. zebra*), and (3) Burchell's zebra (*E. quagga Burchelli*), of which we have many modifications, the chief being the quagga (*E. quagga*), Chapman's zebra (*E. Chapmani*), and Grant's zebra (*E. Granti*). Burchell's zebras have lately been designated as *E. quagga*, an idea which seems very good.

Grevy's Zebra.—This zebra was first described by Dr. Sclater in 1882. Tegetmeier, in his book on zebras, goes so far as to regard

FIG. 8.—Grevy's Zebra.

it as a geographical variation of the mountain zebra. No doubt he here takes the very widest view of the term "species." The conformation differs greatly from all zebras; the head is very large and long, the nasal region being elongated and the jowl rather prominent; the ears are very long and large; the neck is short, and the feet are not so long as in the other zebras. The ground colour of the Imperial zebra, as it is often called, is white, with a large number of thin, blackish stripes arranged in a vertical direction on the trunk and horizontal on the limbs. The stripes in the lower neck region are wider than the others; the mane is erect, without a forelock, and is coloured like the neck; there is a well-marked dorsal stripe, separated from the body stripes by white lines, and these are absent from behind the withers. In front of this the body stripes come out from the dorsal stripe; the stripes fade off on the belly, and this has a ventral line. The height is 14 to 15 hands, and it is the largest of the zebras. The tail has little long hair at its base, and the callosities, present on the fore

limbs only, are small. The colour of the stripes in young individuals is dark chocolate, and this, I think, is more true of older skins. The voice is a hoarse kind of grunt, with intermediate sounds often approaching a whistle. The lighter forms are said to inhabit open country, and the darker more mountainous districts. It inhabits Southern Abyssinia and Somaliland. This species does not appear to have been broken, but some three years ago the Zoological Society made an attempt, and the result was not very gratifying.

The Mountain Zebra.—This form, once very common in Cape Colony, appears to be very scarce at present, this, no doubt, being due to modern firearms and the advance of colonisation. The general conformation resembles the ass closer than any of the other zebras. The ears are long, being often about one foot; the head is asinine, whilst the neck and shoulders are far from equine; the feet are long and

FIG. 9.—The Mountain Zebra.

narrow and resemble those of the ass, being beautifully adapted for scrambling about on rocky ground. The ground colour is whitish, upon which are nearly black stripes; the dark bands being broader than the light give the appearance of a dark ground colour with white stripes. From the head and lumbar region the stripes are vertical and fall off on the ventral surface of the trunk. There is a dark band along the umbilical and gastric regions. From the flank a broad stripe extends across the quarters in an upward direction, to terminate near the root of the tail, and above this is another narrow stripe which sends transverse stripes across the croup to meet similar stripes on the other side, forming what is known to sportsmen as the "gridiron." The muzzle is rufous-brown in colour, and there is a small dorsal stripe. The tail has no long hair at its base; the mane is erect without a forelock; the leg stripes are horizontal and extend down to the hoof. The callosities are not so prominent as those of the fore limb of the horse. The height is about 12 hands. This zebra ranges from

Abyssinia to Cape Colony, and hardly ever goes into the plains of its own free will as do the Burchell group. It has been broken to harness, but is bad tempered, and Hayes, who rode one, speaks very poorly of it. This, no doubt, is due to its conformation and bad ways. Just in front of the brisket is often seen a dewlap, and this, I believe is common to the species, although it is, of course, small compared with that of a ruminant.

Quaggas, Bonte Quaggas, or Burchell Zebras.—Under this common name are described a number of modifications of a single species. I have included the quagga, for it seems to form the initial member of the series. Whether one should make such precise sub-specific distinctions is a debated point, but it has been pointed out that the only way of gaining an exact knowledge of the fauna of any country is by the recognition of such races. Thus it happens that the old bi-nominal nomenclature becomes more or less imperfect, and a third word has now been added. Beginning with the less striped forms we will gradually reach those species which are covered with stripes on the trunk and limbs.

FIG. 10.—The Quagga.

The Quagga.—It may be remarked that the lighter coloration of this group as we go south, is supposed to be due to the fact that there the animals inhabit less luxuriant regions as regards vegetation, the need of protective coloration then becoming less. The quagga is the most horse-like of the zebras, both in regard to ears and general conformation. The tail, however, has little long hair at its base; the mane is erect, and there is no forelock; the height varies from 12 to 13 hands. The ground colour is a browny-dun, with dark bands extending from the jugular furrow up to the mane. In the scapular region the stripes become faint and are completely lost at the middle of the back. A well-marked dorsal line exists, and the muzzle is a brown chestnut colour. The quarters, hind and fore limbs, are of a dirty

white colour, becoming clearer as we approach the digits. The voice of the quagga is suggested in its name, and is shrill, differing greatly from the horse. The quagga used to inhabit Cape Colony, the plains of the Orange River Colony, and part of Griqualand West. It was not seen north of the Vaal. Years ago the quagga was driven, and many authorities spoke highly of it. A quagga was to be seen in the Gardens of the Zoological Society as recently as 1872, but the species is said now to be extinct.

The True Burchell Zebra.—This form is also very rare now, and is, perhaps, a little less like the horse than the quagga, but it agrees with the latter animal in all respects save coloration, and on this hand it has more and different stripes. The general colour is a pale yellow-brown, and the stripes are dark brown; the tail is fuller and more

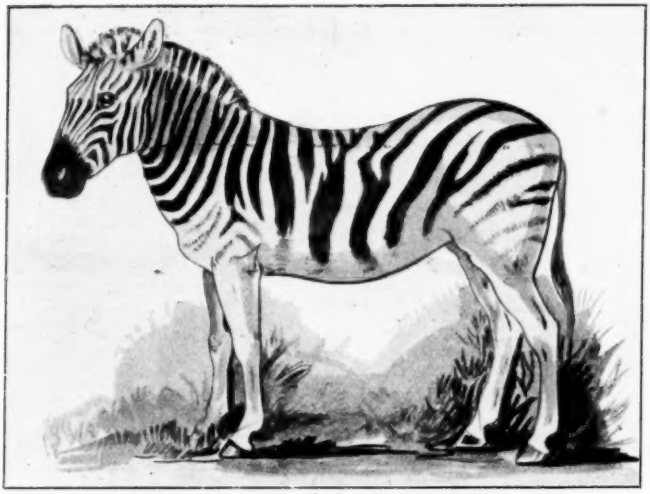


FIG. 11.—The True Burchell Zebra.

horse-like; there are no stripes or markings below the stifle and elbow, and at the shoulder the stripes are already breaking up; in the gluteal region the stripes also begin to shade off and become less complete. Thus it will be seen that this form goes a degree farther in stripings than the quagga.

Chapman's Zebra.—This is probably the commonest form of zebra and is likely in the future to occupy a prominent place in Africa, for it is already being used in coach teams, and one or two breeding establishments have been started. It has also been broken and is a much better ride than one has been led to suppose. The height is from 12 to 13 hands, and the colouring about the same as in the previous form. The dorsal stripe over the haunches has a white line bounding it, and the body stripes do not run at right angles to it as in the mountain zebra. Over the thorax the stripes tend to encircle the trunk, but as the quarters are approached they sweep back towards the tail, these

posterior stripes being much broader. The most characteristic point about Chapman's zebra is the presence of shadow stripes between the

FIG. 12.—Chapman's Zebra.

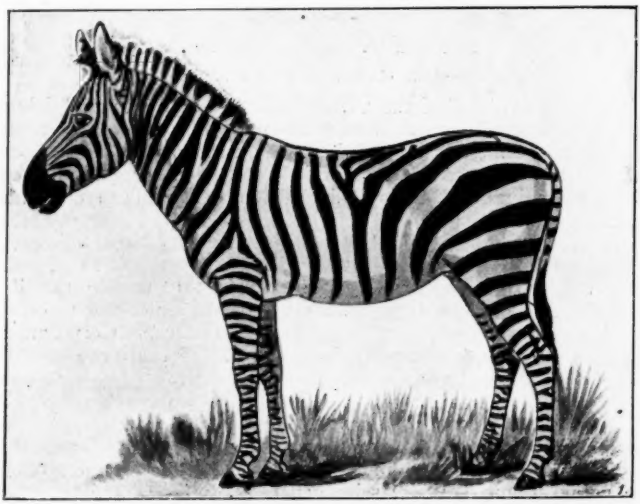


FIG. 13.—Grant's Zebra.

main stripes on the quarters. These are but faint, and generally three or four in number. There is a portion of mane between the ears which has some resemblance to a true forelock. From the elbow and stifle

downwards the stripes assume a very irregular and broken disposition, and may even terminate a little below the knees and hocks. Its bone and many other points seem to indicate that it may become established as a domestic animal in Africa. In districts where horse sickness exists the zebra does not become infected.

Grant's Zebra.—This form resembles the other members of the quagga group; the ground colour is, however, lighter, and the stripes darker, if not black. The patch round the muzzle is a very dark brown. The shadow stripes are absent but the legs are thickly ringed down to the hoofs.

Thus it will be seen that we have reached from the quagga with only a few stripes, through the true Burchell zebra and Chapman's zebra to a form which is completely striped. Besides those described above we have many other forms, such as the Mashona race (*E. q. Selousi*), the Zulu race (*E. q. Wahlbergi*), the Nyasa race (*E. q. Crawshayi*) and Boehm's zebra (*E. q. Boehmi*), but I fear it would be burdening you to describe any more.

In conclusion, I should like to point out that most of the Equidæ have been broken in, and that it is quite possible that any of them might be so treated were it not for the popular ideas on the subject.*

A FORECAST FOR A NEW VETERINARY SURGEONS ACT.

BY FRANK W. GARNETT, M.R.C.V.S.

(*Proceedings of the Central Veterinary Medical Society.*)

In giving a brief *résumé* of the various Charters and Acts pertaining to our profession. it will be seen how it has been found necessary in years past to alter, extend and amend them from time to time, as experience has shown to be necessary, in order to keep the profession in line with the ever changing conditions under which our modern civilisation moves.

The granting of our first Charter in 1844 has been followed by subsequent Charters in the years 1876, 1879, 1883, and 1892, and by Acts of Parliament in 1881 and 1900. It will thus be seen that if we except the Act of 1900 it is twenty-two years since the veterinary profession reviewed its position with regard to its Body Corporate and its relations with contemporary institutions. Experience has been gained during the last twenty-two years of the working of our various Charters and Acts, and I think the time is fast approaching when we shall have to make a careful survey of our position, and, if necessary, bring ourselves up to date and in closer touch with the modern requirements of the profession, by amending their shortcomings and strengthening the position of the profession generally.

* The photographs illustrating the above paper have been placed at my disposal by Mr. A. L. Sheather, M.R.C.V.S., and I am greatly indebted to him for the trouble he took in reproducing them from the original diagrams, which were executed from photographs and life by Mr. R. E. Holding, Veterinary Draughtsman.

CHARTER OF 1844.

Incorporation of R.C.V.S. Veterinary art a profession. Formation of Council of not more than thirty-one or less than twenty-four members, of whom one shall be president, and six vice-presidents, and one secretary, all elected from the members. Annual general meeting first Monday in May. Ten members to form a quorum. Officers to be members of Council and go out of office at the annual general meeting. The first meeting of Council to take place within one month of the annual meeting. Council to have entire charge over the Body Politic. Powers to make bye-laws for the regulation of Councils for the management of the estates, goods, effects and property of the Body. Times and manner of examining students and nature of examinations. Appointment of examiners and admission and rejection of students, either previous to their examination or upon admission as members. No professor to be an examiner. Fee for admission as a member not to exceed ten guineas. Three months notice and a special meeting of Council required to alter bye-laws, and to be confirmed at a special meeting of Council seven to fourteen days after. All property vested in the Body Corporate.

CHARTER OF 1876.

Creates Fellows and Fellowship Degree. Power to appoint Honorary and Foreign Associates. No Member not a Fellow to be eligible as member of Council or to serve on Board of Examiners after ten years from this date. Council elected by members by means of voting papers. Annual meeting may be held every third year in Edinburgh or Dublin. Removal of name from Register requires two-thirds of the Council to be present and a three-quarter majority. Appoint registrar and secretary. Council power to hold land.

CHARTER OF 1879.

Highland and Agricultural Society cease to grant veterinary certificates, and the terms of admittance of holders of that certificate as members of the College. Council to make bye-laws for such admission. Voting papers for Council to be returned three clear days before the election.

ACT OF 1881.

Register of veterinary surgeons to be printed once a year and kept correct. Council bound to examine students in England, Scotland, and Ireland. Section 6: Removal of names from Register. Section 7: Restoration of names. Section 8: Proceeding to be pursued in either section 6 or 7. Register evidence in all cases. Registrars of death in the United Kingdom to report deaths of members and to receive costs of same. Section 11: Penalty for obtaining registration by false pretences. Section 12: Penalty for Registrar making a false entry in Register wilfully. Registration of foreign and colonial practitioners holding diplomas recognised for the time being by the Council, in case of rejection power to appeal to Privy Council. Previous Charters confirmed. Section 15: Existing practitioners to be placed on a separate Register, but no one registered under this section to be deemed a member of the Royal College. Section 16: Penalty for false representation as to Membership or Fellowship of the College. Section 17:

Penalty for using title, name or description of veterinary surgeon or specially qualified to practice the same. Section 18: Exercise of powers under this Act by Privy Council.

CHARTER OF 1883.

Power of Council to make bye-laws, &c., as to minimum age of admission of members. Fees raised to thirteen guineas for admission as members, and five guineas for registration for foreign and colonial practitioners. President, vice-presidents, secretary and treasurer to remain in office till the appointment of their successors. Registrar to be appointed at the same time as president, &c.

CHARTER OF 1885.

Every member eligible for election to the Council who is 26 years of age and has been in practice five years. The president and vice-president to be elected from members of the Council. Number of members of Council to be thirty-two, eight of whom retire annually. Annual general meeting to be held on the first Wednesday in June. Power of Council to hold preliminary examination of all students. No member of Council to be an examiner, and *vice versâ*.

ACT OF 1900.

Extension of disciplinary powers of the R.C.V.S. to holders of the veterinary certificate of the Highland and Agricultural Society of Scotland.

* * * * * * *

It will be seen from the foregoing statement that our various Charters and Acts have been very considerably altered and extended, and new powers conferred on the Council as experience has found necessary. I think I shall be able to show you that there are reasonable grounds existing at the present time as to the necessity of our considering the advisability of obtaining another new Act. If the profession decides that our Charters and Acts require amending it will be for counsel to decide whether we proceed by Charter or Act, or both.

REGISTERED PRACTITIONERS.

The decision of the Privy Council that registered practitioners did not come within or were in any way amenable to the bye-laws of the Council of the Royal College of Veterinary Surgeons has opened up the whole question of the position which registered practitioners hold under the Charters and Acts of the Royal College of Veterinary Surgeons. In the opinion of counsel registered practitioners do not come under Section 6, and if they do not come under that section they cannot come under Section 17. The concluding words of counsel are as follows:—

"Now that the mistake of the Act of 1881 has been discovered by the Privy Council, and as it was a Bill introduced by the head of the Privy Council, and in reference to which the Government draughtsman ought to have seen that consequential amendments were made in the Commons, the Government ought to introduce the necessary amending Act."

Up to this time it had always been taken for granted and acted

upon by the Council that registered practitioners came under Section 6, and their powers had never been disputed. In any new Act it would be necessary to make clear that registered practitioners were legally entitled to call themselves veterinary surgeons and would come under the Act and Charters and bye-laws of the Royal College of Veterinary Surgeons as they had hitherto done. The clauses of the Act of 1900 which brought the holders of the veterinary certificate of the Highland and Agricultural Society of Scotland under the general powers of the Royal College of Veterinary Surgeons, and the inclusion of registered practitioners in Section 17 of the Act of 1881, would be all that would be necessary to make this clear.

Veterinary Surgeons' Companies. Restriction of Practice.

It has been found both by medical practitioners and dentists as well as by veterinary surgeons that unqualified persons, and persons who have been dealt with for unprofessional conduct or otherwise can evade the Charters, Acts and bye-laws of the professions named by recourse to the machinery established by the Companies Acts. In the present session of Parliament both the General Medical Council and Dentists have Bills presented to do away with this anomaly. I suggest that clauses inserted in any new Act we may prepare should be draughted upon the lines of that of the General Medical Council, which are as follows; I have made the necessary corrections:—

(1) It shall be unlawful for a company, directly or indirectly, to practise as or carry on the profession or business of a veterinary surgeon or any branch thereof, and if any company contravenes this enactment, the company and any director, manager, and other officer of the company who knowingly and wilfully authorises or permits the contravention, shall be liable, on summary conviction, to a fine not exceeding £5 for every day during which the contravention happens.

(2) This Section shall apply to every company, whether formed and incorporated before or after the passing of this Act.

(3) Anything which should be an offence under the Veterinary Surgeons Acts or Charters, if committed by an individual, shall be an offence if committed by a company.

Powers of Registration Committee.

I do not think that anyone who has taken an interest in the questions brought before the Committee can say that the work of the Committee has been satisfactory to the profession as a whole. This, I think, is easily accounted for; it is due primarily to the limitations of the powers of the Committee; and secondly, to lack of financial ability to carry out such powers as they possess. Case after case is brought before the Committee by some informant who naturally desires to remain *incognito;* the case is returned to him for further information, which he is unwilling or unable to procure either for financial or other reasons, and the case, of course, is not proceeded with. The profession should realise the limitations of the powers of the Committee. Take a case where one member accuses another of unprofessional conduct. They both appear before the Committee, one of them gets his witnesses to attend and give evidence, the other cannot; the Committee hear the evidence, and are compelled to give their decision on such evidence as is brought before them, which in

such a case as I have cited would have to be on the words of one set of witnesses, which, of course, is absurd, and which must naturally lead to a feeling of injustice to one of the parties. The Committee is blamed, and the *bonâ-fides* of its members impugned, and the credit and prestige of the Council lowered. Then, again, the evidence in a case may be of a frivolous nature, but the Committee or Council have no power to assess costs.

I maintain that in all instances where the Committee have *prima facie* evidence that there is a case to inquire into, it is the duty of the Council themselves to procure the evidence and decide the case on its merits. The cost to the Council of procuring the evidence in cases scattered all over the country would be very great, and the financial resources of the Council are at present utterly inadequate to contemplate such a course being pursued.

In order to make the Registration Committee effective, it would be necessary to increase the powers of the Council by inserting clauses in a new Bill embodying the following :—

(1) To empower the Council to appoint a judicial committee of not more than five of its members for the purpose of investigating questions which may arise under Sections 6, 7, 8, 11, 16 and 17 of the Act of 1881, which are not decided by the Registration Committee.

(2) Such Committee to have power to subpœna witnesses.

(3) Assess costs.

(4) Try all cases brought before them in public.

(5) The findings of such Judicial Committee not to be subject to confirmation by the Council, but subject to appeal to the Privy Council.

It would be the duty of the Registration Committee to procure evidence and lay the same before the Judicial Committee. I feel convinced that the Council must have some such powers as I have indicated above if they are to carry out the work of the Registration Committee in a judicial manner.

Increased powers should also be obtained giving the Council power to advertise in the public Press the name of any Fellow or Member whose name has been removed from the Register for unprofessional conduct.

Annual Registration Fee.

There are few members of the profession, I take it, who would be unwilling to acquiesce in an annual registration fee. The question has been ably laid before the profession by Major Butler, and in my opinion, if we are to look after our own interests and progress in any way at all as a profession, the Council must have more financial power to make itself felt.

The duties of the Registration Committee can only be carried out, even under their present limited form, to their full extent—to the extent to which I believe it is the entire wish of the profession that they should be carried out—if sufficient funds are placed at the disposal of the Council. Again, the work of the Parliamentary Committee, which has been entirely neglected by the Council for many years past, if it is to be efficiently carried out and the interests of the profession adequately protected, will in itself necessitate the Council spending many hundreds of pounds a year. I have just dealt with two of the

pressing needs of the college—but there are others no less pressing—the carrying out of which would require large sums of money to be spent annually upon them ; I refer to the establishment of a veterinary library of international dimensions and of Bodleian character, one in which every work published on the face of the globe might be found and referred to, till our library was acknowledged as *the* reference library of the world on all matters relating to veterinary questions. At the present time we are spending a pound or two a year on binding one or two periodicals which are generously given to the Council.

While the possession of a library of the proportions I have indicated is of the highest importance to the profession, of no less importance to us is the possession of a museum where everything might be found relating to that vast field of comparative work which the pursuit of our calling covers, and which is not supplied by any other institution in Great Britain. Such a museum would be gradually recognised as the centre of all comparative work on diseases of the lower animals, and would be of international dimensions. By spending our money judiciously on these great objects which the position our profession holds among learned societies gives us, we should be only fulfilling a duty, and by the fulfilment of that duty we should at the same time be raising the position of the profession to the place it should hold as head of all comparative medical learning.

There is no other way, in my opinion, to carry out these great and necessary reforms but by affording the R.C.V.S. sufficient financial assistance, and nothing effective can be done in this respect but by the imposition of an annual registration fee of one guinea.

Power to do this would be obtained under a new Act, and the collection would be made in January in each year ; if the fee was not paid by the end of the month the name of the defaulting member would be eliminated from the new Register, which is published in February each year. The payment of the fee would entitle the Member or Fellow to a copy of the Register.

Amendment of Section 17, Act of 1881.

This Section is as follows:—

> 17. (1) If after the thirty-first day of December One thousand eight hundred and eighty-three any person, other than a person who for the time being is on the Register of Veterinary Surgeons, or who at the time of the passing of this Act held the Veterinary Certificate of the Highland and Agricultural Society of Scotland, takes or uses the title of Veterinary Surgeon or Veterinary Practitioner, or any name, title, addition, or description, stating that he is a Veterinary Surgeon or a Practitioner of Veterinary Surgery or of any branch thereof, or is specially qualified to practice the same, he shall be liable to a fine not exceeding twenty pounds.

This Section, on the advice of counsel, wants extending beyond the title or designation, to any person who may *act* as a veterinary surgeon in any branch of veterinary art. Counsel quotes 6 and 7 Vic., C. 73, S. 2, the statute preventing persons not qualified from acting as solicitors in England and Wales, as follows: "From and after the passing of this Act no person shall *act* as an attorney or Solicitor, &c., &c."

The strengthening of this Section in the manner above indicated

would materially increase the powers of the Council in dealing with many of those cases which are now brought before the Registration Committee.

Spurious Degrees.

In a new Act the Council should seek powers to control all degrees in veterinary science which may be instituted by any university or other degree or diploma-granting body.

The view I have in mind in seeking such powers is to adequately protect the Fellows and Members of the Royal College of Veterinary Surgeons, to ensure that no other body shall institute a degree, unless it is of a higher standard as shown both by study and examination, to compete with holders of the Fellowship or Membership Degrees of the Royal College. The buying of degrees in so-called higher veterinary science should be carefully guarded against.

In my opinion no University or other degree or diploma-granting body should have power to grant degrees or diplomas in any branch of veterinary science without having first submitted their scheme and course of instruction, and obtained the approval of the Council of the R.C.V.S. This would mean simply an extension of the principle of our one portal system.

Affiliated Schools with the R.C.V.S.

Increased power must be obtained by giving the R.C.V.S. the right to inspect the classes held in any affiliated school in order to effectively bring the teaching up to the highest level. In case of non-compliance with any regulations of the Council by any school in the conduct of its classes, the Council to have power to refuse to examine the students in the class complained of.

Compulsory Pupilage.

Whenever the Council decides to obtain their next Charter or Act I think it would be well if they included in it a clause giving them permissive powers to make bye-laws regulating a twelve months' pupilage to be taken at any time previous to the final examinations for the Membership Degree.

Exemption from Juries.

This is a question which has been before the profession for many years, and is one in which I think there is entire unanimity of opinion. I need hardly remind you that Mr. Charles Allen tested this question in Ireland and established his case before five judges sitting as a Court of Appeal in Dublin, that veterinary surgeons in Ireland were exempt as medical practitioners from service on juries—that such a practice should obtain in Ireland and not in England is one of those unaccountable anomalies for which the Law is so well known.

Fees and Expenses of Council.

In the Nurses Registration Bill, which is drawn on similar lines to our Act of 1881, there is a clause which I think ought to be inserted in any new Act we may seek to obtain, viz.: "There shall be paid to the members of the Council such fees for attendance and such reasonable travelling expenses as shall from time to time be allowed by the

Council." I do not think it necessary to enlarge upon such a reasonable proposal.

Consequent on any or all of the above provisions becoming embodied in an Act of Parliament, it would be necessary to have a final clause giving the Council power to make bye-laws for the purpose of carrying the same into effect.

(*Veterinary Record.*)

Clinical Articles.

A CASE OF STRYCHNINE POISONING IN A DOG.

BY T. HODGINS, M.R.C.V.S., KENSINGTON, W.

THE under-mentioned case is of interest owing to the fact of the duration of the symptoms of poisoning, the probable dose of poison (1 "tabloid" Eastoni, B.W. and Co.), and the circumstances under which the poison was obtained.

Subject.—A toy ruby King Charles Spaniel (male) 9 months old, and weighing about 8 lb.

4 p.m.—An urgent telephone message was sent to attend the above patient, who was said to be in a fit. Being away at a case I did not receive the message until my return at 6 p.m.

7 p.m.—When I arrived at the client's residence I found the dog stretched out on its left side in a conscious but exhausted condition. On proceeding to examine the patient, and just as I touched the body, the creature went into paroxysms of convulsions, the head was turned back toward the tail (opisthotonus), the respirations impeded. Expression anxious, eyeballs staring, pupils dilated, and the pulse feeble and rapid.

Diagnosis.—Strychnine poisoning.

Treatment.—Learning that the owner had already administered twenty grains of strontium bromide, and seeing that the condition of the dog was serious, I hastened to inject hypodermically ½ gr. of morph. sulph. with the object of causing emesis, and abating the paroxysms and convulsions. However, the patient died within a minute from asphyxia during a paroxysm.

Remarks.—The owner was at a loss to know how the strychnine had been administered, and doubted the correctness of my diagnosis, as malicious poisoning was out of the question. Eventually, on questioning the owner, I learned that a small drawer containing Tabs. Syrup Eastoni (B.W. and Co.) had fallen on the floor at midday; and that although the drawer and contents had been immediately picked up, one or two "tabloids" had been overlooked. On examining the floor where the drawer had fallen, portions of a Tab. Eastoni were immediately found.

In the above case the dog had been fed at 2 p.m., clearing up its meal. It was observed just afterwards chewing something in the place where the drawer had fallen. Evidently the animal had picked up and swallowed one of these sugar-coated "tabloids," and had taken to chew

another when, finding it bitter, had spat it out. Symptoms of poisoning in this case did not appear for one and a half hours after this observation, and I conclude that poisoning was delayed by the stomach being full of food, and that the symptoms appeared just as digestion was proceeding. The length of time during which the dog was under the influence of the poisoning, denotes that the dose was particularly small, probably about $\frac{1}{32}$ of a grain.

Cases of strychnine poisoning in dogs have repeatedly come under my notice, and I consider that forms of strychnine as used in a veterinary pharmacy—such as tinct. of nux vomica, ext. nux. vomica, mist. bismuth, &c., cannot be too carefully dispensed in the case of toy dogs. I have, within the last six weeks, known of a young French bulldog weighing 18 lb., die within an hour of the administration of an eighth of a grain of nux vomica extract.

Such effects from minute doses of nux vomica, leads one to the conclusion that preparations of nux vomica should only be given in serious and obstinate cases in toy dogs, and strychnine should be entirely excluded when these small patients come under our treatment.

AN INTERESTING TWIST OF THE BOWEL.

BY GUY SUTTON, M.R.C.V.S., LONDON, W.

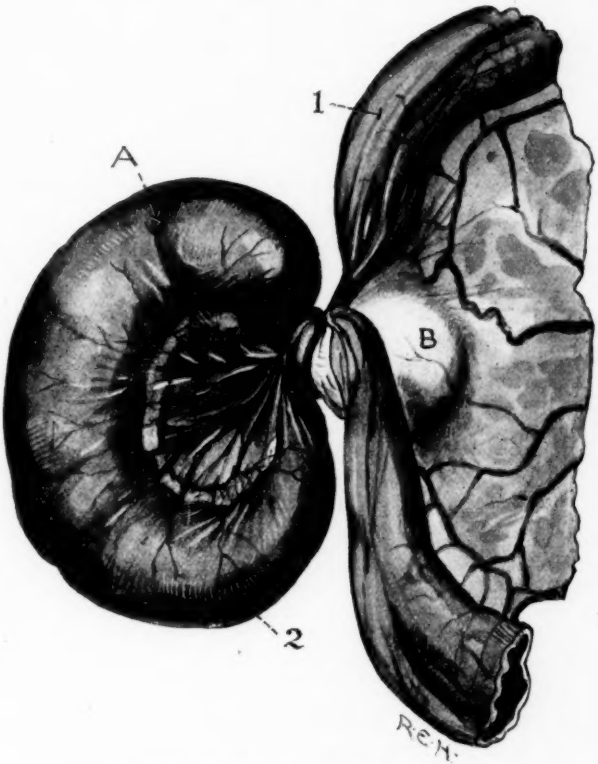
THE accompanying sketch represents the condition of a portion of the jejunum found when making an autopsy, and is remarkable for the small length of intestine involved, the extreme diameters of the "twist" being 8 and 10 inches.

The animal, a pedigree hackney gelding, was known to be aged 28, though still vigorous and engaged in regular work. The attention of his groom was called at 6 a.m. by continuous pawing and the usual manifestations of subacute abdominal pain. The man gave a sedative draught and, as the signs of suffering discomfort continued, repeated it during the course of the day. At 6 p.m. he became somewhat alarmed and sought advice, as in addition to the continued uneasiness the animal refused the evening feed. The horse walked a distance of a few hundred yards, and when first seen his appearance was certainly not distressful, but as the pulse was somewhat weak and small a guarded prognosis was given.

The rectal temperature was 101°, the extremities fairly warm and the conjunctivæ but slightly injected. Fæcal matter had twice been voided during the day, and rectal examination revealed nothing abnormal. There was some slight degree of tympany.

When turned into a padded box he commenced to paw, and would occasionally lash out with a hind leg. A variety of drugs were given as sedatives, antizymotics, intestinal stimulants, together with glycerine enemata and local applications to the abdomen. The symptoms remained practically unchanged, the animal never showing the slightest inclination to roll. About midnight, under the action of chloral hydrate, he lay down, and during the next two hours made several ineffectual attempts to rise, dying at 2·15 a.m., twenty hours from the time when first noticed to be in pain.

Post-mortem examination revealed a ruptured stomach, which I think occurred at the point of death, for, as is usual in horses of this age, the walls were extremely thin. The displaced portion of the small intestine is very well depicted in the sketch (for



Sketch showing the Direction of the Twist.

A.—Loop of the small bowel, much congested; 1 and 2 show the direction of the same portion of the bowel.

B.—Pedunculated lipoma on the other side of the mesentery.

which I am indebted to Mr. R. Holding), and is remarkable for the small area involved and the complication of an ordinary twist by the peduncle of a lipoma, which had entwined itself around the contortion.

INVAGINATION OF CÆCUM EXISTING FOR THIRTY DAYS IN A PONY.

BY GUY SUTTON, M.R.C.V.S.

A POLO pony, seized with abdominal pain on March 30, was most violent, the pulse much increased in frequency, but good in character. Under the influence of morphia the animal became sufficiently quiet to allow of a more thorough examination. The conjunctival mucous membrane was normal in appearance, the rectal temperature 100·2°, and rectal exploration negative. During the following twenty-four hours pain was continuous and the animal exceeding violent.

Prognosis was decidedly unfavourable, as the whole range of symptoms, with the exception of the character of the pulse, suggested "twist."

Towards the end of the second day the pain appeared to abate somewhat, and the pony enjoyed three or four hours of comparative ease and took some water with linseed tea. The temperature was now 104°, the pulse 65 and markedly irregularly intermittent. No fæcal matter was passed during the next four days and the pony received relatively large doses of strychnine, ammonium carbonate and belladonna. Pain now appeared to be intermittent, but certainly was never absent for many hours and made manifest in a variety of ways—rolling, backing, and kneeling with the hind quarters raised.

On the seventh day the bowels commenced to act again, and on a diet of milk, linseed, hay and green fodder, remained fairly regular for the next three weeks, the pony receiving doses of strychnine and belladonna twice daily. The temperature now remained constantly at 102·5° and the pulse varied between 55 and 66, still being irregular. Repeated rectal examination revealed nothing.

In spite of taking a fair amount of nourishment the pony wasted considerably, but on April 20 there commenced a decided improvement. The temperature fell to 100·2° and remained so for three days; the pony then gained quite 2 inches in girth, judged by the roller. On April 28 pain again became violent, the temperature rose to 102°, and the pony rapidly grew weaker and was shot on the following day, being a full calendar month from the onset of symptoms.

When the abdominal cavity was exposed one immediately missed the cæcum and the colon was seen to be enormously distended, and on cutting through the wall the cæcum could be seen completely invaginated within the colon.

The cæcum was dark green in colour, but not putrid. On section the cæcal walls were markedly œdematous and thickened to the extent of 3 to 4 inches, and the lumen formed by the invaginated walls contained a quantity of straw-coloured gelatinous material. The colon and rectum contained a fair amount of ingesta, which must have travelled along the alimentary canal without entering the cæcum.

The *post-mortem* specimen was shown at a recent meeting of the Central Veterinary Medical Association.

A PIN IN THE RECTUM OF A DOG.

BY G. H. LIVESEY, M.R.C.V.S., BRIGHTON.

A BLACK toy pomeranian puppy, aged 4 months, weighing about 2¼ lbs., had been noticed by its owner to have a rather troublesome diarrhœa for two days. No treatment was adopted. On the third day the dog vomited several times, the vomit consisting of undigested food. During the day the diarrhœa ceased, and from then onwards there was no further action of the bowels. On the fourth day the dog went into convulsions twice, each attack lasting about five minutes. The vomiting continued so long as food was administered. The patient was seen by me on the fifth day and appeared a well-nourished puppy. He was lying asleep when first seen and was resting quietly. On touching him or attempting to lift or manipulate him he screamed out loudly, and continued doing so for some minutes when left to himself. The eyes were widely dilated and a look of pain and terror on the face; the belly drawn up but not hard; the back arched and the position crouching, with the tail between the legs. Most pain was evinced when the tail was moved, especially if raised; this led me to examine the rectum. The sphincter of the anus was tightly closed, but a small glycerine enema was eventually given amidst much protest on the part of the dog, and was rejected without fæces. The forefinger of the right hand, smeared with glycerine of belladonna, was then gently inserted into the rectum, this operation taking some five minutes to perform, owing to the cries and struggles of the dog, which was held by its mistress. About 1½ inches from the anus a foreign body was felt lying transversely across the rectum, and seemed to be either a fine splinter of bone or a piece of wire. Eventually one end was secured and the body recognised as a common pin. By careful manipulation with the one finger it was withdrawn. From this moment all pain seemed to cease and the dog made an uneventful recovery.

The pin removed was quite black and must have been inside the dog some days, and undoubtedly I believe its presence gave rise to all the symptoms recorded. Curiously enough, the owner informs me that two days later this little puppy passed another pin in his motion, but this time bright and clean.

It seems to me very interesting and worthy of being recorded that two pins should have luckily passed from the mouth to the rectum *head first*. Threaded needles have been passed in this way, but in these cases no doubt the thread drags the needle along the bowel and prevents it doing the damage it otherwise would. The case is also interesting from the violence of the symptoms with so small a cause and the apparent severity of the pain. Large, sharp bones lodged in the rectum I have often observed to cause far less trouble.

EXTRAORDINARY BEHAVIOUR OF A HALF-BRED FOX TERRIER BITCH DURING AND AFTER ŒSTRUM.

BY ALFRED HEINEMANN, ROYAL VETERINARY COLLEGE, DUBLIN.

THE subject of this note is a five-year-old fox terrier bitch who has had three litters of whelps. The litters have consisted of four, five, and four whelps respectively. There has never been anything abnormal

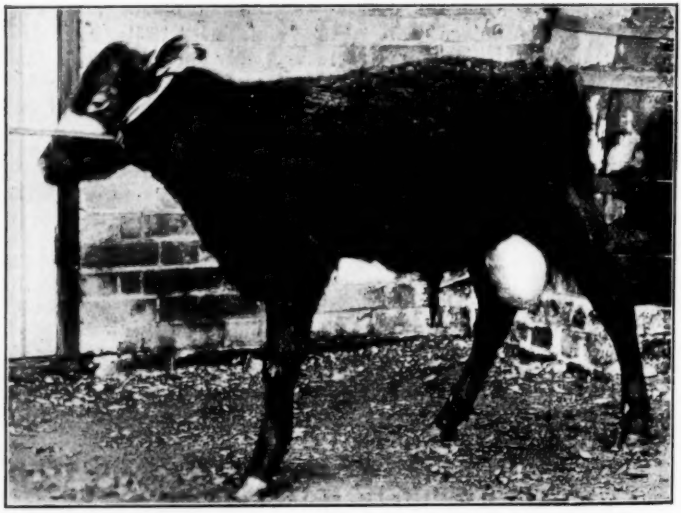
to record about her whelping, each litter having been born without any external aid. The last litter was destroyed, and she was not allowed to rear any of them.

Since then, now over two years ago, she has been kept away from the dog. Her periods of œstrum have been quite regular, but seem to cause her considerable nervous irritation—she becomes listless and intensely irritable. During the following nine weeks she has every indication of being in whelp, her appetite becoming voracious, and towards the end of the time her milk glands become filled, causing her some discomfort. She then selects some secluded corner, makes a bed, and takes a large bone which she insists on nursing for several weeks, leaving it only for a few minutes to take food. Her temper during this time is very irritable, and it is quite impossible to remove the bone. This extraordinary behaviour happens after every period of œstrum, and exactly nine weeks afterwards.

TWO CASES OF SCROTAL HERNIA IN CALVES.

BY H. E. T. MASON, M.R.C.V.S., BISHOP'S STORTFORD.

THE two calves forming the subject of this clinical note had both been previously castrated. I was called in to see them on account of the great swelling of the scrotum, and on examination the swelling in each case was found to be due to a scrotal hernia. The photograph which



I enclose was of the larger rupture. At first I advised slaughter, but finding that they were not going to be sent to the kennels for the hounds, I had them brought to my infirmary to see what I could do for them.

In Case 1, as shown in the photograph, the scrotum reached down to the hocks. The hernia was reducible, but as I could not get clams to fit the case, I attempted to keep it reduced with a suspensory bandage or a sling. This procedure, however, was quite useless, and the hernia got larger, and hung down below the level of the hock. The calf was doing badly, and was evidently in pain, and consequently he was slaughtered.

In Case 2 the rupture was not quite so large. The scrotum hung quite half-way down to the hocks, and was quite as thick as that shown in the photograph. It was "as hard as a board," and irreducible, and therefore clams were out of the question in this case. I endeavoured to soften the contents by diet, but this seemed to have no effect. I then cast the calf daily, and by massaging the part, I found it to be gradually getting smaller. It was so gradual and slow, however, that for the first fortnight I was doubtful whether this procedure was having any effect. At the end of six weeks the calf was discharged from the infirmary, the scrotum being very little larger than normal. With daily gentle massage it has come quite right. This case I thought at the outset to be the less favourable of the two.

I may say that, as a rule, I castrate the calves at the farm where these came from; but a pig-castrator happened to be there about the time these required operating upon, and he was allowed to do them. I should be glad if any readers of the JOURNAL could give me any suggestion as to the probable cause of these two ruptures. Is it merely coincidental with the pig-castrator's operation, or may it be attributable to his *modus operandi?*

AN INTERESTING CASE OF A NEEDLE IN THE ŒSOPHAGUS OF A KITTEN.

BY G. T. DUNNE, M.R.C.V.S., PROFESSOR IN THE ROYAL VETERINARY COLLEGE OF IRELAND, DUBLIN.

THE subject was a valuable Persian kitten about 7 months old, and for two days previous to my seeing it, it had exhibited symptoms suggestive of an attack of acute laryngitis. The owner, a lady, informed me she suspected the animal had swallowed a needle and thread, as her maid stated she had seen the kitten wandering through the house with a short piece of black thread trailing from its mouth—and also that a needle and thread had been lost in the house on the previous evening.

When I saw the kitten it was quite dull and listless, there was a frothy discharge from both nostrils, and a good deal of frothy saliva hanging from the lips. On my attempting to make an examination of the mouth, the animal suddenly developed an unpleasant activity and resisted my efforts in a rather fierce manner. As it seemed quite impossible to make any satisfactory examination I decided on chloroforming, and I did this about an hour afterwards. I now opened the mouth to its widest extent, cleaned away the frothy mucus and made an examination of the fauces, and, with the tongue drawn well forward, of the larynx as well.

Beyond some slight inflammatory changes in these parts I could

not detect any lesion to account for the large amount of discharge from the nostrils and mouth. I next turned my attention to manipulating the neck along the course of the trachea and œsophagus, and having spent nearly ten minutes without discovering anything abnormal, I came to the conclusion it was only a case of laryngitis in which the symptoms were somewhat exaggerated.

I now removed the chloroform muzzle, and while the kitten was recovering consciousness continued manipulating the neck. Suddenly the patient sneezed, and simultaneously I felt the presence of a hard, fine point beneath the skin close to the entrance to the chest. Thinking my efforts were at last rewarded, I cut down on the part, and discovered the needle and thread protruding, *eye first*, through the œsophagus, and extracted them. The needle was $1\frac{1}{4}$ inches in length and very fine, and its removal was followed by the appearance of a few drops of pus. The kitten was kept on a milk diet for two days and made an uneventful recovery.

The case struck me as being one in which a mistake in diagnosis might easily have been made, for had I not been informed that the kitten had probably swallowed a needle, I hardly think I would have expended so much time in examining the neck. Another point about the case is—in what position was the needle lying immediately previous to the time the patient sneezed? because when withdrawing it, its point was directed diagonally into the chest. My own opinion was that the point had penetrated the wall of the œsophagus on the opposite side, became impinged on the first rib, and the slight convulsive effort of sneezing forced the eye through the softer tissue of the œsophagus on the other side.

Abstracts and Reports.

A STUDY OF THE SO-CALLED INFECTIOUS LYMPHOSARCOMA OF DOGS.*

BY S. P. BEEBE AND JAMES EWING, FROM THE HUNTINGTON FUND FOR CANCER RESEARCH, AND THE DEPARTMENT OF PATHOLOGY, CORNELL UNIVERSITY MEDICAL COLLEGE.

For many years the attention of pathologists has been attracted by a venereal disease of dogs, characterised by transmission through coitus, by the presence of nodular tumours of the genitals, multiple secondary growths of the skin, metastases in the inguinal and abdominal lymph nodes, accompanied by cachexia, and often terminating fatally.

* This interesting abstract, which was presented at the meeting of the American Association of Pathologists and Bacteriologists, Baltimore, May 19, 1906, includes a reference to the presence of a spirochæte, and was sent to us by Dr. T. G. Sherwood, a well known veterinary surgeon of New York, and is taken from the *Journal of Medical Research*, September, 1906. It is particularly interesting at the present time on account of the preliminary note sent by Professor Mettam to the February, 1907, number of the Veterinary Journal, in which he too announced that he had detected a spirochæte in a microscopical preparation made from a portion of a venereal growth taken by Professor Wooldridge from the vagina of a bull bitch. In the original article some ten most excellent illustrations of microscopical sections of the tumour growth, and one of the clinical aspect, are given.—[Ed., *V. J.*]

The most significant feature of the disease has been the marked infectiousness of the process, both by natural contagion and by experimental inoculation, but the important bearing of the malady on the general problem of tumours and the unusual facilities which it offers for the experimental study of a bulky tumour readily transmissible between comparatively large animals seem, not to have been fully recognised until recently.

Clinical Features.—The disease is evidently of general distribution, having been described in Russia, France, Germany and England, and we have had no difficulty in securing numerous cases in New York City.*

Young or middle-aged adult dogs of both sexes are chiefly affected. Instances of the spontaneous transference of the disease *per coitum* are reported in detail by Smith and Washbourn and Powell White, and are commonly observed by veterinary surgeons. In the female the disease begins with small nodular or papillary growths, single or multiple, of the vaginal mucosa, whence it extends by metastasis to the neighbouring skin, pelvic and abdominal lymph nodes, and occasionally to more distant organs. In the male the corona glandis is usually first involved by a nodular infiltration with secondary cutaneous tumours, sometimes involving the entire penile sheath. A catarrhal inflammation usually precedes the development or discovery of the tumour, but in many cases the growth appears without any inflammatory irritation. In both sexes isolated growths of the skin may occur in the groin, abdomen, back, neck, and hind or fore legs, as well as in the abdominal lymph nodes, mesentery, spleen, liver, kidney and lung.

The superficial tumours may ulcerate or necrose, but the protected growths are usually found intact. The growths are usually well circumscribed, encapsulated and free from any signs of inflammatory reaction, but in older cases there may be diffuse infiltration of the skin or mucous membrane, which, becoming eroded or ulcerated, may be considerably inflamed and yield a serous or purulent discharge.

In the larger tumours considerable areas may necrose and be sloughed out. Spontaneous regression may occur through a process of fibrosis and atrophy, and permanent disappearance of the disease in this manner has been noted. Local treatment has considerable influence in checking the progress of the disease if instituted early, and Dr. Sherwood informs us that by repeated curettage and application of cautery the early stages of the genital lesions may usually be arrested.

Clinical Conditions in the Dog Resembling Infectious Lymphosarcoma.—Sticker describes two infectious inflammatory diseases of dogs which resemble the infectious lymphosarcoma. (1) The pointed condyloma of the genitals arises after long-continued irritation and produces small papillary excrescences which often reach a considerable size and may produce large firm lobulated outgrowths. Histologically they consist of hypertrophic epithelium supported by new vascular connective tissue infiltrated with round cells. (2) An infectious follicular vaginitis or balanitis arises in the course of chronic purulent catarrh and pro-

* Our material has been secured entirely through the efforts of Dr. T. G. Sherwood, of New York, for whose energetic co-operation we take pleasure in expressing our sincere thanks.

duces multiple tumours of the size of a pea or bean, composed of enlarged lymph nodules which displace the epithelial lining outward.

We have encountered in Dr. Sherwood's clinic cases apparently belonging to the class of follicular vaginitis, but we do not feel certain that such cases can be satisfactorily distinguished from early lymphosarcoma. According to Sticker the true tumour is usually single and may be unaccompanied by catarrhal inflammation, and its cells are of large size, while follicular vaginitis gives multiple superficial tumours, is always marked by purulent discharge, and the lymphoid cells are smaller. Yet Smith and Washbourn state that a constant leucorrhœa is the usual sign of the presence of this tumour, and the multiple tumours which we have examined in cases of vaginitis have shown much the same structure as the metastatic lymphosarcoma. We are inclined, therefore, to suspect that there is a close connection between Sticker's follicular vaginitis and the true lymphosarcoma which many authors have been studying.

Dr. Sherwood assures us that all cases of vaginitis in dogs with submucous nodular growths, if untreated, go on to develop the characteristic lesions of lymphosarcoma, and that the only other form of chronic vaginitis in dogs, as in the human subject, produces only small granular elevations of the epithelium, but never any definite tumours of the size of a pea or bean. We are, therefore, not ready to accept Sticker's description of an infectious inflammatory hyperplasia of the submucous lymph nodules as a separate disease from the lymphosarcoma of various authors.

In one case, which we have recently observed with Dr. Sherwood, an old dog presented much more extensive lesions of the type of lymphosarcoma than any we have found described. The skin of the genitals and groin was thickly infiltrated with many flat masses, over which the skin was eroded, dry and shiny. There were several large tumours and many smaller ones on the back, and hind and fore legs. The skin of the lips, face and head was beset by a large number of nodules or flat plates covered by reddened shiny cuticle. The lymph nodes of the groin, pelvis, abdomen, and those about the jaws and neck were much enlarged by extensions of the tumour process. The spleen was nearly doubled in size by many small nodules which had the distribution of the Malpighian bodies. On section of this organ the pulp was found to contain many islands of nucleated red blood cells interspersed with many typical myeloid giant cells. In the liver the portal canals were extensively infiltrated by masses of small round cells. The structure of all these tumours was that of small-cell lymphosarcoma. On account of the small size of the cells lying in a lymphoid reticulum, the myeloid changes in the spleen, the universal distribution of the tumours, and absence of leucocytosis, we regard this case as one of lymphadenia, and quite different from the infectious lymphosarcoma. We have encountered one other case of this type in which the liver was chiefly involved. The extensive involvement of the genitals might readily lead to the error of mistaking this disease for the infectious lymphosarcoma.

The above observations, and other peculiarities briefly noted in the literature, emphasise the need of more thorough clinical study of the infectious tumour than it has yet received. Several important problems seem to await solution largely through such clinical study. It is

possible that more than one disease has been included in the studies of various observers, and that some conflicting results may therein find an explanation. More minute investigation of the beginnings of the disease may throw important light on the etiological factors. The fully developed spontaneous disease ought to display more clearly the true position of the malady among pathological processes. The relations of the entire group of lymphosarcomata are here brought into question under conditions unusually favourable for their experimental study.

Gross and Microscopical Appearance of the Spontaneous Tumours.—The tumours are rather soft, elastic, well-circumscribed masses of grayish-white tissue yielding a mucinous fluid on pressure, or they may be firmer and contain more fibrous tissue, especially when regressing. In size they vary from early minute nodules to multiple growths as large as an orange. Caseation is not observed, but large areas in voluminous tumours may necrose. Microscopically, the cells are uniformly large, round or polygonal, with pale staining or clear protoplasm and single nuclei with prominent nucleoli, and often showing mitotic figures. They much resemble the large proliferating cells of lymph follicles. These cells are arranged not in alveoli, but in cords supported by thin strands of connective tissue, or, in rapidly growing specimens, there are diffuse areas of cells, while in regressing cases the connective tissue may appear in numerous isolated masses of considerable bulk. The blood vessels are moderately developed. Multiplication of cells occurs in all parts of the tumour, producing a growth which displaces the surrounding connective tissue outward as a capsule, which is entirely free from signs of inflammatory reaction.

Our studies have not furnished satisfactory grounds for the exact histological classification of this tumour. While it most resembles a large-cell lymphosarcoma, the cells are polygonal more often than round, the fine reticulum of a lymphosarcoma is missing, the growth is much less malignant than large-cell lymphosarcoma in man, the arrangement of the cells in alveoli without lumina is sometimes distinct, the protoplasm of the cells is nearly homogeneous, and a mucinous discharge from the cut surface of the tumours is characteristic. The general histological characters suggest to us the diagnosis of alveolar sarcoma or endothelioma. The particular tissue cells giving origin to the tumour have never been determined.

Experimental Inoculation.—Nowinsky (1877), who first described the disease in detail, also reported its successful transference by inoculation of the tumours. From an ulcerated recurrent tumour of one year's growth in the vagina, he transplanted pieces to the subcutaneous tissue of three young dogs, and in the course of three or four months saw the development of isolated tumours as large as a walnut or egg. The structure of all the tumours was that of myxosarcoma. No further study of the condition appears to have been made until 1888-9, when Wehr reported the successful transfer of several of the tumours in a series of twenty-four dogs. In one of these, after a year's growth, there were found numerous metastases in the peritoneum and abdominal organs. Since that time the tumour has been studied and numerous successful inoculations practised by Duplay and Cazin, Geissler, Smith and Washbourn, Powell White, Sanfelice, Sticker and Bashford, Murray and Cramer.

The observations of these authors have demonstrated many important facts regarding the inoculability of the process. The animals successfully inoculated have included many breeds, all varieties of dogs appearing to be about equally susceptible. Sticker transferred the tumour from a dog to two foxes, but failed to secure growths in cats, guinea-pigs, rabbits, rats and mice. Young animals have been chiefly employed, but Smith and Washbourn found that the tumours grew larger in older dogs, and that a moderate proportion of animals possess complete natural immunity.

The course of successful implantations is usually quite uniform. When inserted beneath the skin a period of two or three weeks elapses before any definite enlargement is noted. Thereafter the nodule may steadily increase in size for four or five months, producing a well-circumscribed tumour as large as a hen's egg or small orange. Smaller secondary tumours may develop in the neighbourhood, or in the abdomen, spleen, liver and lung. In progressive cases the tumours reach their largest dimensions in three to six months, and the animals die with cachexia and emaciation, often aggravated by sloughing and infection of the larger masses. At any period the tumours may cease to grow, and a regressive process begins which ends in a complete atrophy, after which the animals have usually been found completely immune to reinoculation. Sticker reports spontaneous disappearance of subcutaneous tumours in eighteen out of sixty experimental cases. It has been remarked by Sticker and has been our experience, that while the spontaneous disease often extends through the lymph nodes, the subcutaneous experimental tumours are usually fatal, without affecting the lymph nodes. Geissler, however, saw extensive involvement of peritoneum, abdominal nodes and spleen, eight months after inoculation of the ventral skin. Sticker observed six cases in which tumours implanted in various localities directly invaded lymph nodes, a course which he referred chiefly to the influence of complicating infections of the tumour. Besides the regional metastases Sticker reports several cases of general sarcomatosis following inoculation, with numerous nodules in the skin, spleen, liver, kidneys, and heart and skeletal muscles, pointing to dissemination through the blood-vessels.

Intraperitoneal inoculation was extensively practised by Sticker. Here small multiple tumours of the omentum developed in two months, and in three months diffuse sarcomatosis throughout the peritoneum. Some of his omental tumours reached the size of a cocoanut. Extensive growths followed inoculation of the pleura and tunica vaginalis, while successful implantations were made in the stomach wall, liver, lung, orbit and bone marrow.

It has been a remarkable feature of the inoculation experiments that by merely rubbing the scarified mucosa with portions of the tumour, successful results have been secured. Smith and Washbourn, Duplay and Cazin, and Sticker, all report that after such procedure the inflammatory reaction subsides and in a few weeks single or multiple tumours develop. Complete comminution of the tumour cells destroys the inoculability of the material, and filtrates of tumour emulsions passed through paper or earthen filters are innocuous. The tumour cells are still viable after exposure for twenty-four hours at — 14° C., but are killed when heated for two hours at 54° C. (Sticker).

The implantation experiments which form the basis for this report

were begun in the spring of 1905, and the first plants were made from a tumour of the vagina removed at operation by Dr. Sherwood. A section of the growth used for implantation has in every case been kept for histological examination. These earlier plants were made by two methods, viz., implantation subcutaneously of a thin section of tumour tissue, and infusion of a suspension of the tumour cells into one of the mesenteric veins.

The tumour pulp was strained through gauze before inoculating. Under these conditions the meshes of the gauze become filled with the gelatinous fragments of tumour tissue, so that only the very finest particles can pass. Such filtrates give much fewer successful inoculations than are obtained when larger particles are included.

The material was brought to the laboratory from the operating room in a special double-walled vessel so arranged that a water jacket kept the inner chamber at body temperature. In view of the extraordinary vitality of the tumour cells, such a precaution was probably unnecessary. These four earlier experiments made with growths removed from the vagina gave negative results. Previous to the operative removal, one of the tumours from which plants were made had been subjected to treatment by curettage and the application of cautery. It is quite probable that this procedure had interfered with the normal vitality of the ceils.

For the later experiments, begun in the fall of 1905, the tumour tissue was obtained from the left inguinal lymph nodes of a 5-year-old male Irish terrier. The primary growth was found on the sheath of the penis, but the penis itself was not involved in this case.

A number of dogs were planted with small grafts subcutaneously on the abdomen, others by subcutaneous injection of a suspension of the tumour cells. All of the animals which had been planted by the first method developed tumours in from three to five weeks. The second group were failures. All of the tumours which we have studied experimentally have come from this successful implantation.

The tumour is now in its fifth generation and continues to grow with undiminished vigour. One hundred and twenty-two plants, by various methods, have been made on twenty-nine dogs of various ages and breeds. From this number thirty-five tumours have developed and there have been twelve spontaneous recoveries.

Certain generalisations may be drawn from the statistics and conditions of these experiments: Old dogs grow the tumour better than young animals. The rate of growth is in a rough way dependent upon the general health of the animal. With poor nutritive conditions the growth is rapid, and improvement of health, following operative removal of a portion of the tumours, is often accompanied by a regression of the remainder. Spontaneous recovery is a common phenomenon, and generally occurs in young, vigorous animals. Four recovered animals we have been unable to infect a second time. In a susceptible animal only a portion of the plants may grow. If one tumour starts to regress, all do. We have never seen some tumours regressing and others growing vigorously in the same animal at the same time.

The crucial point which we have attempted to settle in this study has been the question of the mode of origin of the tumour, *i.e.*, whether the growth comes from the proliferation of the transplanted cells or by stimulation of the surrounding tissue cells, as maintained by Bash-

ford, Murray and Cramer. The small sections which we have planted for this purpose have been taken from actively-growing tumours, and have been planted in other locations on the same animal that furnished the seed. By such procedure we are sure of having a susceptible animal, but in such conditions not every plant will grow.

The small operation wounds healed kindly, and after waiting the desired interval, the plant, together with the surrounding tissue, was removed and preserved for histological study.

It may be a point of considerable importance to note that the operation wounds, from which we afterwards removed tumour grafts, healed in every case by primary union, so that the inflammatory reaction was caused only by the traumatism of the operation. It is readily understood that the particular changes which we wished to observe might easily be obscured by the inflammation following infection.

Histology of the Transplanted Tumours.—Throughout our entire series of transplantations the structure of the tumour has remained remarkably uniform, agreeing in this respect with the experience of all previous observers. The cells always maintain their large size, round or polygonal form, single nuclei with prominent nucleoli, clear or slightly granular protoplasm with indifferent affinity for eosin (Müller-formol fixation), and arrangement in cords without alveolar lumina, supported by thin strands of connective tissue. Sharp demarcation from the surrounding tissue and absence of round-cell infiltration and caseation, are nearly constant features of uncomplicated growths. When the tumours regress there is a focal thickening of the trabecula with simple or degenerative atrophy of the cells, without necrosis. The surrounding tissue is displaced mechanically by the tumour and is usually quite free from signs of inflammation or participation in the growths.

Histological Study of the Fate of the Transplanted Cells.—For this purpose pieces of the tumour, implanted in the manner described, were excised with the surrounding tissue at intervals of one to twenty-one days, hardened in Müller-formol, cut in paraffin and stained by hæmatoxylin and eosin.

Twenty-four Hour Specimens.—Pieces excised after twenty-four hours are found to be lying loosely adherent to the surrounding tissue. On section the nodules are lying in a mass of fibrin, serum and red blood cells, while polynuclear leucocytes are abundant in the surrounding vessels and blood clot. The compact nodule of tumour tissue is entirely necrotic except for a few islands of ten to fifty intact cells, lying along the periphery of the piece. These islands are clearly shown to belong to the transplanted piece by their morphology, immediate relations to the necrotic central portions, and separation from the host's tissues by a well-defined layer of fibrin or leucocytes. Not all the cells in these islands are intact. Some are necrosed, others degenerating, most are normal, and a few show mitotic figures.

Forty-eight Hour Specimens.—After two days the nodules are more fully adherent, and the only histological change noted is increased œdema and diminished leucocytosis in the surrounding tissues of the host. The peripheral islands of tumour cells appear as before, and it now becomes evident that these islands are in contact with small blood-vessels, apparently those of the original tumour, which contain

normal red blood cells, as though circulation had become restored in them. The sharp separation of most of the islands from the host's tissues is even more apparent than before.

Three-day Specimens.—At this time the implanted piece has become well fused with the subcutaneous tissue of the host, which remains œdematous and infiltrated with polynuclear leucocytes. The peripheral islands of intact cells are now usually fused into a definite layer surrounding the necrotic centre, and are clearly visible to the naked eye in the stained section. In this layer are many blood-vessels containing blood, which appears to have been in physiological condition. Some of these vessels must have belonged to the original tumour, since they are too large to have been developed in three days. The outer edges of the layer of tumour cells are again sharply separated by strands of fibrin from the host's tissues, and we could find no trace of the transformation of fibroblasts or any other cells of the host into tumour cells. At this stage many of the tumour cells show mitosis.

Six-day Specimens.—The peripheral layer of tumour cells has now increased in depth, while the necrotic central mass has undergone some absorption, and œdema and leucocytosis have largely disappeared. The tumour cells have, in some segments, displaced the host's tissues before them, forming a thin capsule which separates the tumour from the subcutaneous fat and connective tissue. At other points this separation is less complete and here the tumour cells seem to be mingling with the multiplying fibroblasts of the host. Even in such foci, which are rare, the tumour cells are usually distinguishable from the fibroblasts, and we are unable to see any definite evidence of transformation of fibroblasts into tumour cells. Such areas, however, have doubtless formed the basis of the claim by Bashford, Murray, and Cramer, that the tumour develops exclusively from infected subcutaneous fibroblasts which become transformed into tumour cells. Such areas of mingled fibroblasts, and tumour cells are rare in our specimens. All but small portions of the circumference of our implanted nodules are, from the first, sharply separated from the surrounding connective tissues by fibrin, fat, or a cellular connective tissue, and in by far the greater part of the growing mass we find it impossible to conceive how the growing cells can be derived from the host's cells.

Fifteen Days.—At this time the nodule has reached the size of a pea, the necrotic material has been absorbed, the cells are actively multiplying by mitosis. Their arrangement is identical with that of other tumours, and the entire mass is sharply separated from the surrounding tissue by a definite capsule. The surrounding tissue is rather vascular, but exhibits no other signs of inflammation.

At twenty-one days the appearances have been exactly similar to those found at fifteen days.

Biological Studies.—Sanfelice has been the only observer to report positive results from the search for micro-organisms in the tumour. He observed in fresh preparations of fragments removed from a vaginal growth, refractile double contoured bodies which he regarded as yeasts. These he was able to cultivate on ordinary media, and the culture proved pathogenic for small animals, but caused only inflammatory reactions. Sticker conducted systematic cultures from the growths on various media under aerobic and anaerobic conditions. The results

were negative. Smith and Washbourn, Bashford, Murray, Cramer and Sticker, all mention the comparative freedom of the cells from the usual forms of cell inclusions.

On account of the clinical resemblance of the disease to syphilis, we have regularly examined material from the original growths and from the experimental tumours for spirochætæ. Spreads were made from the affected mucous surfaces and from the interior of tumour masses, and stained by Procas' or Goldhorn's methods. From some cases the tissue was prepared according to Levaditi's second method for the demonstration of spirochætæ. In seven clinical cases we failed to find any spiral organisms, which seem not to be common saprophytes of the genital organs of dogs. In one large multiple tumour, growing from a transplanted piece, which was sloughing extensively, some large spiral organisms, resembling *Spirochæta refringens*, were found on the necrotic surface and within well-preserved portions of the tumour. In all other cases the results were negative. Spreads from actively growing tumours are remarkably free from bodies resembling micro-organisms, and from the usual cell inclusions of tumours.

Nature of the Infectious Lymphosarcoma of Dogs.

The foregoing description of the clinical and pathological characters may form a basis for discussion of the nature of the disease. If the process is an infectious granuloma it is of some practical interest to dog fanciers, and from the standpoint of descriptive comparative pathology, but if it is a true neoplasm, it possesses very great practical and theoretical importance for the general problem of malignant tumours.

From the beginning of the observations on the disease up to the present time opinions regarding the nature of the process have been at variance. Nowinsky and Wehr speak of the growth as a carcinoma, but do not appear to have attempted a careful distinction between carcinoma and sarcoma. Geissler at first regarded his tumour as a carcinoma on account of the alveolar arrangement (he did not speak of lumina in the alveoli), but the discussion of his communication favoured the diagnosis of sarcoma. The description indicates that his specimens were infiltrated with leucocytes. Hansemann, from a cursory examination, pronounced the growths exhibited by Geissler to be granulation tissue or sarcoma. Duplay and Cazin were uncertain as to the nature of their tumour. Smith and Washbourn, Sanfelice, White and Sticker are certain that their tumours must be regarded histologically as round-cell sarcoma. Bashford, Murray and Cramer believe that they have proven that the process is an infectious granuloma, finding that the transplanted cells necrose while the new tumour grows from the infected cells of the host.

Sticker secured specimens of the tumours studied by Wehr, Geissler, Smith and Washbourn, Sanfelice and Bashford, and submitted them, with his own, to a large number of German pathologists, all of whom agreed upon the diagnosis of round-cell sarcoma.

Supported by this diagnosis of recognised authorities on the structure of tumours, Sticker compares the general features of the disease with malignant tumours in man, and shows that on all these grounds the growth must be accepted as a true malignant neoplasm.

(1) Clinically, the other infectious venereal diseases of dogs resembling lymphosarcoma always cause prolonged inflammation and multiple nodules, which are merely enlarged lymph follicles, while inoculation of the vagina by the true tumour produces little or no inflammation, which soon subsides and is followed by solitary, or at best two or three, tumours arising in the subcutaneous tissue.

(2) Histologically, the tumour is entirely different from any known infectious granuloma, is not accompanied by any inflammatory reaction in the neighbouring tissues, and produces metastases which develop from cells carried by the blood stream, and without participation of the tissue cells.

(3) Experimentally it is necessary to transfer living cells in order to secure a growth, while tumour emulsion finely comminuted, or strained through paper or porcelain, is innocuous.

(4) The spontaneous transference of the tumour is paralleled by the cases of *cancer à deux*, and of epithelioma of the upper transferred from the lower lip in man.

(5) The spontaneous disappearance of the tumour in dogs is quite comparable to the occasional disappearance of sarcoma and even of carcinoma (Orth) in man.

It must be admitted that Sticker's argument presents a body of evidence which speaks very strongly in favour of the opinion that the infectious lymphosarcoma of dogs is a true tumour. Our experience with the disease fully supports his views, with the possible exception that we are unable as yet to satisfactorily distinguish between his follicular vaginitis and the lymphosarcoma.

Yet, in spite of the opinions of many eminent pathologists based on the histology of the growths, the whole argument appears fatally defective when direct experimental evidence, as furnished by Bashford, Murray, and Cramer, indicates that the transplanted cells die and the tumour grows by infection of other tissue cells. This is the crucial test of an infectious granuloma as against a neoplasm, and if the observations of the English Commission are correct the decision, in our opinion, lies conclusively in their favour. In any event, Bashford, Murray, and Cramer have discerned the true method for determining the nature of the process, and the futility of relying upon the histological appearance of the tumours, no matter how experienced the authorities consulted.

Our study of the disease was undertaken with the same object of determining the fate of the transplanted cells, and in spite of preconceived opinions, we had already reached a contrary conclusion when the results of the English Commission came to hand.

As indicated in the description of the changes occurring in the transplanted pieces of tumour, we are unable to confirm the results obtained by Bashford, Murray, and Cramer. In our specimens all the cells of the transplanted pieces do not perish, but a few peripheral islands of cells always remain alive, showing mitotic division from the first day, and separated from the tissues of the host so clearly as to leave no doubt that the transplanted cells give rise to the tumour. Between the third and fifth days, when, according to the English Commission, all the transplanted cells have perished, our specimens show very active mitosis in a definite layer of tumour cells separated from the surrounding tissue by fibrin. In our experiments the critical time for

the transplanted cells comes in the first forty-eight hours, when most of the cells necrose, after which mitotic figures in the remaining cells become very numerous.

That some tissue cells may be included in the tumour or be transformed into tumour cells we are not prepared to deny, although there is no definite evidence of such a process in our specimens.

We are unable to explain fully these contrary results of observations on the fate of the cells. It seems possible that Bashford and his associates were dealing with a less active tumour than ours, and with more resistant animals, and that the surviving cells in their experiments were too few to be recognisable as belonging to the transplanted nodule. This suggestion appears the more plausible since these observers state that the transformation of tissue cells into tumour cells is noted chiefly about slowly-growing tumours which are not well encapsulated. Such slowly-growing tumours, however, are less suitable for revealing the true capacities of the cells for independent existence. They admit, also, that in more rapidly-growing tumours the chief part of the growth arises from the tumour cells, while the transformatian of fibroblasts is not always in evidence. Yet in progressive infectious granulomata, tissue cells are always being involved in the lesion, and the recorded observations of Bashford, Murray, and Cramer do not seem to fully support their conclusions regarding the nature of the process.

It may be suggested, also, that if an infected tumour were used for transplantation, the inflammation resulting from the bacterial infection might obscure the fate of the transplanted cells.

In view of all the clinical and pathological characters of the disease described by previous observers, many of which we have been able to verify, and of the results of the attempt to trace the fate of the transplanted cells, we are forced to conclude that the infectious lymphosarcoma of dogs is a true malignant neoplasm, of which the cells show, perhaps, a greater capacity for independent existence and infectivity than is seen in any other known tumour process.

The highly infectious nature of the process led Smith and Washbourn to regard the instance of this disease as a powerful argument in favour of the parasitic origin of malignant tumours. If, however, the transplanted cells continue to grow and produce the tumour, then the infectiousness of the process becomes an equally strong argument against a parasitic origin.

Yet the experimental evidence will not permit us to decide positively for or against the parasitic theory. There is the possibility that the tumour cell may contain within itself some form of micro-organism which is the source of the peculiar form of stimulation that is the essential factor in the growth activities of the host. We can, however, formulate certain conditions which the hypothetical parasite must follow in this particular instance without committing ourselves to the declaration that such conditions are universal for tumour growth.

We have no knowledge of the parasite outside of the host cell. All those means of comminution which destroy the integrity of the tumour cell stop at the same time its infectiousness. The parasite, if it does exist outside of the host cell, is harmless. Those forms of injury which affect the tumour cell, injure at the same time, and to the same degree, the intracellular parasite. This parallel is particularly interesting with

reference to cold. Sticker has found it possible to cool the cells to —14° C. and still have growth. Now —14° C. is that critical temperature which Folin has found for the protoplasm of frog's muscle. If exposed from — 15° to —21° C. the muscle goes into rigor on warming, while at —14° C. or above, the tissue is still irritable when thawed. The critical temperatures of heat and cold of host cell and parasite, must be identical. The very careful biological study of the growth indicates that the parasite must be of ultra-microscopic size, or that its protoplasm has such close agreement in staining properties with the tumour cell, and has such an homogeneous arrangement within the latter as to be impossible of discernment by methods now at our disposal. Our only knowledge of the parasite's existence is its supposed responsibility for the growth activities of the tumour. Since the life of the parasite and the manifestation of its activities in producing a malignant growth are absolutely dependent upon the transfer of a living tumour cell from one individual to another, there can be no objection to considering the tumour cell the essential infective agent in the process of transmission. Such conditions imply a symbiotic relation between the two consociating cells that is without analogue in such cases as have already been investigated either in the animal or the vegetable kingdom. The conditions require so intimate and vital a relation between parasite and tumour cell that it is impossible to make any distinction between them.

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CONTAGIOUS MAMMITIS: SOME OBSERVATIONS REGARDING ITS TREATMENT, THE EFFECT OF ANTISEPTIC INJECTIONS, AND THE CONDITION OF THE MAMMARY SECRETION.

BY J. A. GILRUTH, M.R.C.V.S., CHIEF VETERINARIAN AND BACTERIOLOGIST TO THE GOVERNMENT OF NEW ZEALAND.

(*Extract from his Report for* 1906.)

Aphozone Treatment.—This drug is prepared by Messrs. Frederick Stearns and Co. Its formula is $(COOH.CH_2CH_2CO)_2O_2$. It was employed in solutions of 1 in 1,000, 1 in 2,000, and 1 in 3,000, and was left in the affected quarter eight to ten minutes. In no case was the

result satisfactory. All the solutions caused the purulent material to coagulate in the milk sinuses, and occasionally it was with difficulty (in the case of the strongest solution with some degree of pain to the animal) that these masses could be drawn through the lactiferous (teat) duct. The strongest solution rapidly altered the whole appearance of the secretion, in two days it being blood-tinged, and resolving itself after settling into serosity and flocculent purulent deposit. Although the strong solution was only employed for two days, the quarter and the secretion never approached the normal afterwards. Gradually the secretion diminished, and ultimately almost ceased, although the presence of streptococci could always be demonstrated. The weaker solutions did not produce the same serious effect, although the pathological condition of the secretion was increased by its use.

That even the strongest solution had little or no bactericidal effect within the udder, was proved by the fact that media inoculated with the deposit of the injected solution an hour after it had been withdrawn from the quarter developed colonies of the streptococcus.

It should be observed, in justice to this product, that further experiments are necessary. The material used for injection was secured locally, in the form of powder, and experimentally had little bactericidal action on the streptococcus. Shortly afterwards, however, I received a fresh sample, in tablet form, and this certainly was much more powerful, even a 1 in 2,000 solution causing death of the cocci within half an hour; but I have had no opportunity of testing this thoroughly on another case.

Boracic Acid.—Injections of 4 per cent. solution do not seem to induce any rapid improvement in the character of the secretion. The purulent deposit seems to increase slightly at first, and the number of streptococci do not markedly diminish. We have found, however, if the solution be injected twice daily after milking, allowed to remain in the vessel for about ten minutes, during which time gentle but thorough massage of the quarter is conducted, and this treatment discontinued at the end of three or four days, that recovery thereafter takes place fairly rapidly. The solution of boracic acid does not readily kill the organisms, but it seems to weaken their virulence, for after the above treatment the purulent deposit rapidly decreases, and the organisms can soon only be demonstrated by cultured methods. For example, we have found that in $\frac{1}{4}$ cc. of affected milk thoroughly mixed with 10 cc. of boracic acid solution, the streptococci are not destroyed at the end of an hour. For the reasons already stated, it has been possible to make no attempt to ascertain definitely by means of detailed experiment, such as suggests itself, whether the solution does really weaken the virulence of the organism, but so far actual experience points definitely in that direction.

Sodium Fluoride.—A solution of 1 to 5 per 1,000 is recommended by Moussu in his recent work as the best treatment for this disease. At first, however, we could not secure a supply of this drug in New Zealand, which delayed experiment. It was ultimately tried on a suitable case—one where there was a considerable deposit of pus cells in the secretion on settling, although few organisms, and these mostly intracellular.

For three days the quarter was irrigated with 0·3 per cent. solution in the usual way, but there was no apparent alteration either in bulk

or appearance. Injection was discontinued for two days, during which time there was an increase of pus cells. The same strength of solution was again injected, and was again followed by an increased deposit of pus cells. For the next four days the strength of the solution was reduced to 0·2 per cent., during which time the purulent deposit increased in quantity until it reached almost a third of the total secretion. Injections were then stopped, and *the secretion improved daily.* In three days the deposit had practically disappeared, and the only abnormality apparent was in the viscous nature of the "cream," which was greater than normal, and on microscopical examination proved to contain many pus cells, which had been carried up by the globules of fat.

Like the boric acid, the sodium fluoride solution, even 1 in 500, has little bactericidal effect, for the latter solution tested in the same way as the former had not caused death of the streptococci in milk an hour after mixing with forty times the quantity of sodium fluoride, even 1 in 500 solution.

Effect of Injections.—Since these experiments were conducted several officers have confirmed in the field the deduction that the best method to employ with injections either of boracic acid or sodium fluoride solutions in this disease, is to (1) inject them into the affected quarter; (2) massage the quarter containing the solution for eight to ten minutes; and (3) withdraw the solution. This should be done twice daily for three or four days and then discontinued, when it will be found that the character of the secretion will gradually return to normal in appearance. As, however, the cream may, on microscopical examination, be found to still contain pus cells with cocci for weeks afterwards, it is wise to dry the quarter off, and so prevent further contamination of a new quarter or a new cow. Meanwhile, of course, the milk from that quarter should not be used for human consumption.

Symptoms of the Disease.—It cannot be too strongly insisted upon that in very many cases the udder presents absolutely no evidence of the presence of the disease that can be detected by ordinary manipulation. Although frequently the teat duct is thickened, and an annular swelling of a more or less diffuse nature may be detected at the base, these changes are not constant. This is exceedingly important from the point of view of inspection of dairy herds. A casual examination of the udder is practically useless, and even manipulation cannot be relied upon. The character of the secretion, especially where there is reason to suspect the presence of the disease in a herd, should be carefully observed, and not alone that from each cow, but from each quarter of the udder. Even the acid reaction of the secretion is not a safe guide. In numerous cases I have found the milk, on withdrawal from a vessel, give a slightly acid reaction, and yet prove absolutely healthy so far as any other test could determine. On the other hand, I have found the secretion in fairly advanced cases of mammitis distinctly alkaline, particularly in cases where there were numbers of catarrhal cells and few streptococci. It is true that in such cases the milk becomes rapidly acid through the growth of the streptococci after collection, but that does not assist in diagnosis.

The most satisfactory test is the formation of a dirty brownish, easily detected deposit, after standing the milk for a few minutes in a glass vessel. But even the absence of that deposit is not an absolute

guarantee of freedom from catarrhal cells and attendant streptococci. For example, in the instances which I have had under observation, during recovery it has been found that, though the milk had become normal judged by the absence of any deposit or abnormal appearance, yet the cream on forming was found to contain numerous pus-cells, some enclosing cocci. My attention was first called to the condition of the cream by its viscosity, rapidity of formation, and apparent increase of quantity in a case where the purulent deposit was very great; and since then the cream has in these cases been regularly examined microscopically. Beautiful polynuclear lymphocytes with a few eosinophile cells form the deposit, and little or no degeneration of these cells is evident. The "cream" on microscopical examination in such cases, is found also to consist of a great number of these classes of cells, many undergoing more or less fatty degeneration, which, along with the fact that some are apt to become entangled with the rising fat globules, accounts for their presence on the surface of the milk after settling.

Since ascertaining the probability of pus-cells being present in the cream, examination of other secretions shows that in cases of mammitis they are just as readily detected there by the microscope as in the material from the bottom of the vessel. Obviously, therefore, the streptococci causing this disease are just as likely to be carried through cream (and, for that part, butter) as through the milk proper.

The observations just related serve as a guide in preserving the interests of public health no less than in the prevention of the spread of disease within a herd, and the following summary may be adduced:—

(1) Careful examination of the secretion from each quarter as well as manipulation of the udder itself is necessary.

(2) Where any suspicion is present, the milk should be allowed to stand in a glass vessel for some time.

(3) The presence or absence of acidity is not a reliable criterion.

(4) To the bacteriologist the apparent absence of the streptococcus is not reliable. The presence of pus-cells is a safe guide, and in the absence of any apparent microbes, on microscopical examination, further proof may be obtained by placing a small quantity in the incubator at blood heat over night.

(5) In a sample both the material at the bottom of the vessel and the cream should be examined.

(6) After *apparent* recovery of an affected quarter, it should be dried off for the remainder of the season, as a preventive precaution both in the interests of human and animal health.

(7) The necessity for the complete and periodical examination of all cows, and the insistence on the notification of all udder disease, which I have so long and so fruitlessly advocated, is more than ever demonstrated.

(8) The necessity for further experiments, and for a more educational system of inspection than any yet instituted, is also demonstrated.

ACUTE DERMATITIS OF THE FACE AND EARS OF SHEEP, DUE TO A COCCUS.

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(*Extract from his Report for* 1906.)

IN January, 1904, the existence of a peculiar disease affecting the head —particularly the skin of the ears, nostrils, and mouth—on a large merino sheep station in the South Island, was brought under my notice by the manager. As the disease seemed to be entirely a new one, had only been noticed during December and January of the three preceding summers, was confined to one paddock, and had resulted in the death of a number of sheep, Mr. Snowball was instructed to visit the station and investigate.

Unfortunately, by the time he reached there shearing had practically finished, and the sheep had all been removed to the hill pasture. He was only able to examine one sheep affected, but it was not a satisfactory case, the animal, a wether, having almost recovered. It was slaughtered, and specimens secured and forwarded for laboratory examination, which in this case did not shed any light on the subject. Mr. Snowball reported fully on the history of the disease, general appearance of the case, nature of the paddock, &c., as derived from the manager's observations.

Early in January this year the manager communicated, as requested, the appearance of fresh cases, and Mr. Kerrigan investigated, it being impossible for Mr. Snowball to leave his other work. As a result of this visit specimens were secured which enabled us to decide as to the nature of the disease, and to isolate what is evidently the causal pathogenic microbe.

History.—The station consists of about 300,000 acres of hill and mountain country, covered with natural tussock and some common weeds, such as nettles, star-thistle, &c.

About eighty thousand merino sheep are carried when fully stocked. About the last week of December the sheep are mustered into two paddocks near the homestead for shearing, and it is only in one of these paddocks—about 12,000 acres in extent—that the disease has occurred. The other paddock, as well as the remainder of the station, has remained unaffected. The two home paddocks are apparently exactly similar as regards soil, herbage, and water-supply, the formation being shingly plain surrounded by high hills, dry, covered with natural herbage similar to that on the station generally (tussock, &c.), and watered by a creek with gravelly bottom.

The disease appears only during about three weeks during December and January, when the sheep are annually mustered for shearing. At other periods of the year no affected sheep have ever been observed. Generally from September to the middle or end of December there are no sheep in the paddock, but in winter there are always sheep there, and these show no symptoms of the disease. It first appeared in the summer of 1902-3, when the shearing was prolonged on account of wet weather, and a large number—nearly 1 per cent.—were affected. The next year the season was good, and the sheep being only in the paddock for a week comparatively few became affected so far as was observed. Next year (1904-5), the season being again unfavourable, and the

paddock longer stocked in consequence, a larger number contracted the disease, although they were removed on this account as soon as possible. This summer it again made its appearance, but as soon as this was observed the stock were removed.

Symptoms.—The following is Mr. Kerrigan's description: When first noticed, the skin covering the nasal and superior maxillary bones, the upper and lower lips, eyelids and the distal half of the ears, is hard and tense, and covered in some places by a thin layer of dried serosity. There is also an œdematous condition of the subcutaneous tissues of these regions, which causes the nostrils to become partially occluded, the accumulation of muco-serous exudate at their external openings frequently completely closing them and forcing the animal to breathe through the mouth. This œdematous condition soon disappears, leaving the skin in a dry and brittle condition, it ultimately becoming necrotic and sloughing from the affected parts.

Prehension of herbage is impossible through inability to use the lips, and I believe it is partly due to this and partly to the occlusion of the nostrils that death of the affected animals occurs.

The Schneiderian membrane is congested, and there is a narrow dark purple ring of congestion around the coronets of each foot of the animals examined, the latter condition being absent in the healthy animals.

Beyond a small quantity of serous exudate (1½ ozs.) in the pericardium, the internal organs are normal.

There was no evidence as to how long the sheep were in the paddock before the first case appeared.

Cause.—The manager, Mr. Snowball, and Mr. Kerrigan all agree that there is apparently nothing in the paddock which can account for the complaint, and that it is to all intents similar to the other mustering paddock, in which no cases have occurred.

Smearings on slides, and pipettes of blood, pericardial serosity, and of subcutaneous œdematous material, as well as portions of affected skin and mucous membrane, were forwarded by Mr. Kerrigan for further examination.

The blood and serosity contained no organisms, and the pipettes containing these fluids remained sterile even after prolonged stay at blood heat. Smears from the subcutaneous œdema received from Mr. Kerrigan, and smears made by me from portions of affected tissue, however, showed the presence of numerous cocci, generally in groups or in pairs.

Cocci were also found in the contents of pipettes filled from the subcutaneous effusion.

Sections of lips, skin of nostrils, ears, &c., showed acute dermatitis, with congestion of blood-vessels and hyperplasia. Here and there, chiefly in the cutis vera and subcutaneous tissue immediately underneath, were very small degenerated areas, amongst which were scattered cocci, generally in small dense masses. These cocci (like those in the smears) stained readily with the method of Gram. None were demonstrated in the coronet lesions, which consisted only of a congested area.

The cocci were readily cultivated on ordinary artificial media, both at room and blood temperatures.

Appearances on Media.—On serum the cocci form circular colonies with smooth edges and slightly raised centre. At first whitish, they

gradually assume a yellowish tinge. On agar the colonies are similar, and earlier cultures showed a slight lemon tinge, which later on was lost in subcultures. Gelatine in stabs is rapidly liquefied cylindrically, but the growth does not diffuse, and shows a remarkable cohesive tendency, the needle carrying away a comparatively large quantity. In broth, cloudiness is rapidly developed, and there is formation of a large cohesive deposit. On potato the growth is slow, and forms a distinctly brownish-yellow growth. Growth in milk is rapid, and it becomes curdled in twenty-four hours. In liquid media the cocci are in groups, chiefly distributed as staphylococci, but many having a streptococcic arrangement. On all solid media the cocci are difficult to separate from each other, and present more of the characteristics of zooglœa than of staphylococci. Indol is not formed.

Experiments (*Lamb, 4 Months Old*).—Inoculated in subcutaneous tissue of inner surface of thigh with 1 cc. broth subculture twenty-four hours old. The following morning the animal was prostrate, pulse almost uncountable, respirations 220, and temperature 106°F. There was a considerable swelling, hot and painful, but with no discoloration at the region of inoculation.

The following day the symptoms were similar, but that the animal was able to stand; the temperature fell to 105·2°F., and the respirations were 200, the pulse being still very frequent. Food was still refused, and when movement was forced the inoculated leg was carried. The whole of the internal aspect of the leg was swollen from the groin to the hock-joint.

During the next four days there was gradual improvement, the temperature falling daily till it remained at 104°F., while the respirations and pulse became also less frequent, though the former continued high. The appetite returned slightly on the fourth day, and the animal moved without compulsion. The lameness of the leg remained very marked, and little or no weight was placed thereon in movement. The swelling ceased to be so painful to the touch, and the skin temperature gradually decreased.

On the sixth day after inoculation, as the animal was definitely not likely to succumb and improvement was rapid, it was decided to slaughter.

Post-mortem Examination.—On comparison of the inoculated limb with the other before skinning, there did not appear any great abnormality. Manipulation detected diffuse subcutaneous swelling with a large firm area just at the seat of the inoculation.

When skinning was attempted the whole of the skin below the epidermal layer was found to be thickened and firmly adherent to the subcutaneous tissue, from which it could barely be distinguished. The whole skin and subcutaneous tissue of the inner surface of the limb, down to the inferior border of the tarsus, presented the appearance so characteristic of the changes that occur in the disease of the horse termed "lymphangitis." There was the same thickening of the areolar tissue and dermis, with intense infiltration of serous effusions and semi-caseous material.

At the point of inoculation situated amongst the muscles of the thigh was a large hæmorrhagic mass the size of an orange. This clot was composed partly of degenerated necrotic muscle, but chiefly of blood, and was sharply circumscribed by the ragged edges of the

muscles, which were of greyish colour. Bands of degenerated muscle-tissue extended inwards to the femur and upwards as far as the acetabulum. All other organs were normal with the exception of a few punctiform hæmorrhages on the surface of the spleen.

Microscopical examination of the serosity and degenerated material showed very few cocci, these being most numerous in the blood-clot, from which they were recovered in a state of purity.

The blood and spleen contained no organisms, and pipette contents remained sterile after forty-eight hours at blood heat.

Other Experiments.—The organism soon loses some of its virulence through growth on artificial media. A sheep was inoculated in the cheek with 0·25 cc. broth culture, being the fourth subculture from that originally used. The following day there was diffuse subcutaneous swelling over a considerable surface, extending forward to the nostril and downward to the inferior border of the jaw. The nasal chamber was injected and catarrhal. The temperature could not be ascertained properly, the animal being very wild, but there was no evidence of constitutional disturbance. The swelling gradually became less diffuse, and ultimately formed a subcutaneous abscess the size of a small orange, which burst spontaneously the thirteenth day after inoculation, and this was followed by complete recovery.

A calf inoculated in the side behind the shoulder with ½ cc. culture of the same date as that received by the sheep inoculated in the cheek developed a temperature of 105°F. next day, though there was little apparent swelling. The following day there was distinct diffuse swelling, the temperature being 104·8°. The temperature fell to normal in two days, while the swelling gradually increased, but became more circumscribed, until a fortnight after inoculation it was the size of a football. It was then incised and found to contain thick, yellowish pus, in which were numerous cocci.

Attempts to transfer the disease by rubbing cultures on to slightly scarified surfaces of skin of the face failed. Intravenous injections failed to produce any serious results.

These experiments (which attempts will be made to repeat next year, if opportunity permit) demonstrate the cause of the disease fairly conclusively to be the coccus described.

The means whereby inoculation occurs under natural conditions is difficult to understand. Personally, I am inclined to believe the spines, or prickles, of thistles or other plants (of which the sheep, or some sheep, are fond) must act as the agents of introduction. I have placed this suggestion before the manager, but he knows of nothing likely to cause such injuries, which at least are more prevalent in the affected paddock than in the other. However, seeing that each paddock covers an area of 12,000 acres, there may be something at that time of year which, with a working hypothesis, may yet be ascertained.

Mr. Kerrigan has heard that the disease is not unknown elsewhere, and it is hoped that more extended observations may throw more definite light upon the whole subject. Heretofore, owing to the extremely small percentage affected, it is possible that others may have deemed the matter not worthy of attention.

The experiments confirm to a great extent Mr. Kerrigan's opinion that death is not the direct result of the disease, but is due immediately to the interference with feeding and breathing induced by the swelling of the skin of the nostrils, lips, &c.

Reviews.

SYNOPSIS OF THE BRITISH PHARMACOPŒIA. By H. Whittell Gadd, F.C.S. Sixth Edition. Pp. 227, $2\frac{1}{4} \times 4\frac{3}{4}$. London: Baillière, Tindall and Cox. Price 1s. net.

THE necessity for the issue of the sixth edition of this very handy little book speaks for itself. Already five editions have been sold out, completing the tenth thousand. In this edition has been included a synopsis of the Poison Laws of Great Britain and Ireland, which should be found useful to students of pharmacy and practitioners. We think the summaries of the various British Pharmacopœia preparations would be particularly useful to practitioners who do their own dispensing, and to students of Class C in the Veterinary Colleges. A number of non-official standards and tests are also included. They were apparently set forth tentatively originally, but, we are told, have since been confirmed by experience.

We certainly think the purchase of the booklet would be a shilling well invested. The publishers have not allowed the low price of the book to interfere with their customary thoroughness of production.

THE SIMPLE MEDICAL YEAR BOOK, OR PRIVATE MEDICAL LEDGER. London: John Bale, Sons and Danielsson, Ltd. Price 10s. 6d.

ALTHOUGH this method of account keeping was introduced principally for the medical profession, it will be found very useful indeed to the veterinary profession. We are afraid that, like doctors, veterinary surgeons are not above reproach for the lack of method in account keeping, and it is only with very great difficulty that they can find out at the end of the year how they stand with regard to that year. The adoption of the system recommended by the publishers completely overcomes that difficulty, and allows a practitioner to see clearly how things are going week by week, and quarter by quarter, as well as at the end of the year. We cannot do better than to repeat the comments of the *Lancet*, which we have no hesitation in endorsing:—

"For the system followed in the work now before us a high position may be fairly claimed on the ground of simplicity, convenience and readiness of reference to past transactions. The first fifty-three pages are ruled with horizontal lines, one for each day of the week, and are further divided into vertical columns provided with a variety of headings under which a place may be found for any item of income or expenditure. There is, therefore, one page allotted to each week of the year, with debit and credit columns on each page. The totals of the columns on each page obviously show the financial results of the practice for each week, and these totals as they are obtained are copied into four other pages having exactly similar columns but ruled with thirteen horizontal lines for the thirteen weeks of each quarter. Finally, there is a 'summary for the year,' with debit and credit sides from which the balance or net result for the year is readily obtained. In addition to these facilities for recording and exhibiting the items and totals of income and expenditure the book contains some other useful features, such as twenty-eight alphabeticised pages for memoranda, on which any transactions requiring a special description may be entered at length. The compiler has throughout kept in view the difficulty which professional men not infrequently experience in estimat-

ing their expenditure with a view to filling up the income tax assessment form. He devotes three pages to various suggestions and recommendations under the head of 'Income Tax Notes,' and believes that he has succeeded in producing an ideal private ledger which, when supplemented by an ordinary day book and ledger, will render other account books superfluous. The pages measure 8½ by 5½ ins. They are interleaved with stout white blotting paper on which pencil notes explanatory of the entries in the adjacent columns may be made if required."

DAVOS AS A HEALTH RESORT. By W. R. Huggard, M.D., &c., and others. Printed and published by the Davos Printing Co., Davos, Switzerland.

WE have long known of the claims of Davos as a resort for those seeking health, and especially in connection with tubercular patients. This little book sets forth all the advantages in an irresistible manner, and one almost wonders after reading it how persons could possibly remain healthy in places lacking all these special provisions against disease. One chapter in particular is of interest to the veterinary profession with reference to the occurrence of tuberculosis of cattle at Davos, and consequently we extract the following:—

"A public slaughter-house, in which all the beasts killed are subjected to veterinary inspection, serves to prevent any possible infection from tubercular meat. Last year tubercular changes were seen in only 2 per cent. of the bullocks slaughtered. . . . The milk supply is almost entirely in the hands of a Central Dairy under the control of the Medical Association. But cattle tuberculosis, and especially tuberculosis of the udder, is very rare. In the year 1903-4 tubercular changes were only nine times clinically observed among 2,000 head of cattle. In this connection it is to be observed that all cattle which become ill at Davos are seen by a veterinary surgeon, because all animals are insured, and without a veterinary certificate no compensation is paid. . . . It is also interesting to learn that during seven years' practice the Davos District Veterinary surgeon has only twice seen tuberculosis of the udder."

FOURTEENTH INTERNATIONAL CONGRESS FOR HYGIENE AND DEMOGRAPHY.

THE exhibition which is proposed in connection with the Fourteenth International Congress for Hygiene and Demography, to be held in Berlin from September 23 to 29, should be of the highest importance. The participation in it of scientific institutes, State and municipal authorities, as well as private persons, is large; thus we are able to assure the members of the Congress an up-to-date view of hygiene in a scientific and practical way. The fight against infectious diseases, principally colonial and tropical, hygiene undertakings of States and municipalities, especially the care of infants, the providing of good drinking water, the removal of waste, and hygiene in schools will be represented in an exhaustive and interesting manner. In consideration of the great importance which hygiene has in private and public

life, it has been resolved to keep open the Exhibition, which will be held in the "Reichstag," after the closure of the Congress, up to the end of September. All persons interested will have a full opportunity to make themselves acquainted with this branch of medicine, to which we may ascribe the diminution of the general mortality and the considerable increase of the average age during the last ten years.

DOGS AND THEIR LICENCES.

If your friend who has been spending a holiday with you leaves his dog in your care for a short time, be careful to ascertain whether the necessary licence for the animal has been duly taken out, for, mind you, you are responsible for the dog whilst it is in your house, and if you cannot produce the licence the owner should have taken out, the authorities will look to you to provide another. At a case heard in the local Court last week something of this sort occurred, the defendant being summoned for not having a licence for a dog which he explained had been left behind by a gentleman for him to keep, but who, being asked to pay something for the canine's board and lodgings, declined to do so, and left the dog instead.

The defendant thought the real owner had taken out the licence, but the authorities want no surmise in the matter, and summoned the man, and he had to pay 10s. Of course, as one of the magistrates pointed out, if people were allowed to keep their friend's dogs without taking out a licence, the law could be effectively evaded by adopting a general principle of exchange. This would result in a decrease to the revenue, and an increase of the friends—and sometimes enemies—of man.

(*Upton-on-Severn News.*)

[We should be glad if some of our professional brethren who are members of the Bar, or who are Justices of the Peace, would let us know the position as to liability, &c., of a veterinary surgeon under similar conditions.—Ed., *V.J.*]

Personal.

The municipal *Guild Gazette* for this month contains an excellent portrait and sketch of Mr. T. Eaton Jones, M.R.C.V.S., Veterinary Superintendent of the Corporation of Liverpool. Due recognition is given by the writer to Mr. Eaton Jones's eminence as an expert among horses, and the valuable work he has done in connection with the May Day Parade.

(*Liverpool Echo.*)

Mr. H. B. Eve, M.R.C.V.S., was appointed by the Council of the East Kent Agricultural Society, one of the Veterinary Inspectors at the Agricultural Show, held at Folkestone, on July 3 and 4. He has also been appointed Official Veterinary Surgeon to the Folkestone racecourse at Westenhanger Park.

Translations and Extracts.

THE QUANTITATIVE ANALYSIS OF GLYCOGEN AS A MEANS OF DETECTING HORSEFLESH.

BY DR. M. MARTIN (CARLSRUHE).

THE author has carried out an elaborate series of experiments in Professor Gamelin's laboratory at Stuttgart, as to the value of different methods of quantitative analysis for glycogen, and gives the following conclusions. He considers the Brucke-Keeler method the most satisfactory. Reduction is the most exact, but the quickest is the polarimetric method. The horseflesh glycogen will remain for a long time unaltered in horseflesh, and for a considerable time in fœtal flesh. On the contrary, after the lapse of a few days only traces are found in beef, veal and pork. Horse and fœtal flesh in sausages can be detected by Pfeuger's process. The admixture of 10 per cent. horseflesh can be detected. Glycogen disappears from salted or smoked horseflesh.

(*Revue Générale de Médecine Vétérinaire.*)

PIROPLASMOSIS.

BY M. L. PANISSET, EX CHEF DE TRAVAUX, ALFORT VETERINARY SCHOOL.

UNDER the term piroplasmosis are included a number of diseases that affect most of the larger domestic animals, and which are caused by an endoglobular hæmatozoon belonging to the genus *Piroplasma*.

Distribution.—In 1888, Babés first reported the existence of round brilliant corpuscles in the red blood corpuscles of cattle suffering from epizootic hæmoglobinuria on the banks of the Danube, and in the following year Smith noticed the same in Texas fever. Since then bovine piroplasmosis has been found on both continents.

Piroplasma bigeminum has been discovered in cattle in Finland and in Sardinia by Soi and San Felice. The bovine piroplasmosis in the Roman Campagna and Lombardy, Germany, Norway, Russia (Dschunkowsky and Luhs, "The Piroplasmosis of Cattle," *Wieitnik Obschteestwiennoi Wietierinaryi*, September, Nos. 17 and 18, and *Revue Générale de Médecine Vétérinaire*, vol. ii., 1903, p. 542), and Holland (Dr. Jong, "Piroplasmosis in Dutch Cattle," *Tijdschrift voor Veearteenijkunde*, May, 1903, and *Revue Générale de Médecine Vétérinaire*, vol. ii., 1903, p. 35). In Turkey it has been studied by Nicolle and Adil-bey, and in France by Mathis in 1896, and Lignières in 1900. It was also found in Belgium and Portugal. Great Britain (Montgomery, "Preliminary Note on the Presence of *Piroplasma Bovis* in England," *Veterinary Record*, June 11, 1904) and Ireland are both infected. Bovine piroplasmosis is widespread in both North and South America, Australia, and the Philippines.

In Africa (Theiler, "Piroplasmosis in South Africa," *Fortschritte der veterinar Hygiene*, July, 1903, p. 133) bovine piroplasmosis has existed for ages past on the east coast, and was studied in 1898 by Robert Koch, (Professor Koch, "Third Report on Rhodesian Hæmaturia or

African Coast Fever," *Veterinary Record*, February 13, 1904). Later on he found a peculiar form of bovine piroplasmosis in Rhodesia and East Africa, which he designated Rhodesian redwater or African Coast fever, to distinguish it from redwater or Texas fever.

Bovine piroplasmosis also exists in French West Africa (Wilbert, "Notes on Piroplasmosis in French West Africa," *Revue Générale de Médecine Vétérinaire*, vol. vi., 1905, p. 227) and the Cameroons. The "mal de bron" of Algeria is also caused by the *P. bigeminum*, which has been proved also to exist in Tunis and Egypt.

Ovine Piroplasmosis.—Babés, in 1892, first discovered that the disease in sheep in Roumania known as "carceag" was due to a hæmatozoon (Motos, "Carceag, or Ovine Piroplasmosis," *Comptes rendus de la Société de Biologie*, No. 37, December 27, 1902, p. 1523, and *Revue Générale de Médecine Vétérinaire*, vol. i., 1903, p. 210), and it gives rise to icterohæmaturia in the Campagna of Padua and Rome. It is known in Constantinople, France, and South Africa, where it is termed Cape catarrhal fever of sheep. It is well known in French West Africa, and in the Danish West Indies there is a disease in sheep similar to Roumanian "carceag."

Equine Piroplasmosis.—*P. equi* causes severe losses in the Cape, Natal, and the Transvaal (Theiler, "Equine Malaria and its Complications"), also in Madagascar (Thiroux, "Note on the Existence of Piroplasmosis in Horses in Madagascar," *Comptes rendus de la Société de Biologie*, October 24, 1903, p. 1118, and *Revue Générale de Médecine Vétérinaire*, vol. iii., 1904, p. 62) and French West Africa. Dale ("Piroplasmosis in the Donkey," *Journal of Comparative Pathology and Therapeutics*, December, 1903, p. 312) and Theiler ("Piroplasmosis in the Mule and Donkey," *Revue Générale de Médecine Vétérinaire*, vol. vi., 1905, p. 81) have seen a disease in donkeys and mules in the Transvaal caused by a piroplasma probably identical with that of the horse. Baruchello and Mori ("The Etiology of a So-called Typhus or Petechial Fever in the Horse," *Revista d' artiglieria e genio*, vol. iii., 1905, and *Revue Générale de Médecine Vétérinaire*, February 15, 1906) found an endoglobular piroplasma in an epizootic among horses that had a typhoid character in the neighbourhood of Rome. It was more common amongst studs of horses than those kept by themselves. No doubt it was isolated cases of this nature that were seen by Guglielmi and Russi in Central Italy and Ziemann in Germany. It would therefore seem that enzootic and epizootic piroplasmosis in horses extends all over Europe, and up to the present has been classified as a "typhoid" affection.

Canine Piroplasmosis.—This was first described in 1895 by Piance and Galli-Valerio. It has also been seen at the Cape, in Senegal, French West Africa by Wilbert ("Notes on Piroplasmosis in French West Africa," *Revue Générale de Médecine Vétérinaire*, vol. vi., 1905, p. 227), and in France by Nocard and Almy in 1891.

Symptoms.—Piroplasmosis attacks all animals in two forms, acute and chronic, and both types may be seen in the same epizootic in the same locality, and the symptoms of the different varieties so strongly resemble each other as to make detection impossible.

Acute Form.—The disease commences with dulness, loss of appetite, and rapid rise of temperature. The mucous membranes, which are at first injected, become pale, and they often have a yellow tinge. The respirations are quick and short and the pulse weak; bowels relaxed,

and there is often diarrhœa, the fæces being tinged with blood. The patients rapidly become exhausted, and the urine, which is frequently voided in small quantities, becomes dark in colour, sometimes almost black, and contains a large quantity of hæmoglobin, but hæmaturia is uncommon. There is, however, a large quantity of albumen, and in certain cases in which there was but a small quantity of hæmoglobin the biliary pigments were excessive (F. Maignon, "Alteration of the Urine in Canine Piroplasmosis, Glycosuria and Azoturia; Analogy with Human Paludism," *Soc. Sciences Vétérinaire de Lyon*, October 25, 1903, and *Revue Générale de Médecine Vétérinaire*, vol. iv., 1904, p. 295).

The anæmia gradually increases and the blood becomes pale and watery. If the patient suffers from hæmoglobinuria the serum is pink or red, if from jaundice, yellow; and in a few hours the number of red blood corpuscles will fall greatly below the normal. Lignières has seen these in the ox decrease from 8,200,000 to 1,800,000, and in the dog from 7,000,000 to 2,000,000. The proportion of hæmoglobin falls to 6 and even 3 per cent. in the dog, and 7 to 8 per cent. in the sheep. In some hæmoglobinuric cases nervous symptoms have been seen, Lignières mentioning frenzy and paralysis of the hind quarters. In most cases the acute form is fatal, but in the subacute recoveries are known, the symptoms gradually extending and the hæmoglobinuria disappearing.

Depending on the species of animal, some of these symptoms may be absent, or, on the contrary, they may be exaggerated. In American bovine piroplasmosis the debility is so great that the disease is known as "tristeza," and the hæmoglobinuria which is common in certain epidemics, especially in Germany and France, and in tristeza and redwater, is quite exceptional in Rhodesian redwater or East Coast fever.

The icterus which is the rule in equine piroplasmosis is often absent in cattle or sheep, but is seen in about two-thirds of the cases in dogs.

The duration of the acute form varies with the species of animal attacked. The ox usually dies within from four to six days, although cases have been known to last for eight days. Rhodesian redwater is extremely fatal. In the dog the acute form is most dangerous, death in the majority of cases taking place between the third and tenth days, and in the sheep about 50 per cent. recover, but fatal cases die in about six days. In the horse death takes place at a variable period, but a certain percentage recover.

Subacute Form.—There is partial paralysis, anorexia, and, as in the acute form, the respiration and heart beats are quickened, with a rise in the temperature. There is seldom hæmaturia, but always anæmia. These symptoms last for some weeks, when they gradually subside, death being the exception. The progress of the disease varies. In the ox it reaches its height in from eight to fifteen days, in the sheep a month, in the dog three to six weeks. In calves the subacute form is usually seen, but in lambs and puppies the acute.

Acclimatised animals are much less susceptible than new arrivals. Theiler and Hutcheon point out that the native horse of the Transvaal is almost immune, whereas the English and Argentine imported during the Boer War suffered greatly.

Pathological Anatomy.—The spleen, kidney, liver and blood are the

organs most commonly implicated. The spleen is always enlarged, and of a dark brown colour, turning red on exposure to the atmosphere. It is granular and disintegrated, and in the horse sometimes pulpy and black. The kidneys are ecchymosed on the surface, with hæmorrhagic effusion into the cortex in the acute forms; in the subacute they are anæmic, with peripheral infiltration. The liver is congested, enlarged and soft; in the acute, shrunken, friable, and yellow in the subacute form of the disease.

The blood is dark in colour, and the serum tinged with blood or of a greenish-yellow. The red globules are pale, of a variable shape, and early alter their form even in normal serum. In examining them microscopically, to avoid this difficulty, Motas advises that normal serum from the same species of animal should be used as a medium. There is great increase in the number of mono- and polynuclear leucocytes.

In the blood of patients that have recovered or are convalescent there are a considerable number of hæmatites that contain granules which are not of a parasitic nature, and are common to most anæmic conditions.

The digestive, circulatory, respiratory and ganglionic systems are all involved. There is inflammation of the digestive organs; and in Rhodesian redwater submucous hæmorrhage and tissue alterations that are likely to be mistaken for cattle plague. The pericardium often contains a quantity of blood-stained fluid and the muscular tissue is pale, with ecchymosis under the endocardium. In some cases the lungs are œdematous.

In Rhodesian redwater there is hæmorrhagic pleurisy which is not seen in the other forms of piroplasmosis. The changes in the lymphatic glands are œdematous infiltration with petechial spots. As a rule the muscles are perfectly normal, and in the Argentine the flesh of animals that have suffered from tristeza is eaten. In some forms, however, they have either a boiled appearance or a dark sepia tint.

Pathogenic Agents.—Piroplasmosis is caused by hæmatozoa of the genus *Piroplasma*, which are usually endoglobular, although they are sometimes found floating free in the plasma. If fresh blood mixed with an equal volume of aqueous humour is examined on a hot stage, the parasite can be distinguished easily, as sometimes they have amœboid movements.

In preparations stained by Laveran's, Nocard-Motas's or Nocard's process, the parasite is seen to consist of a mass of protoplasm of a pale blue colour, with a red or violet nucleus, and of two forms, one a pyriform, the other round. The blood corpuscles may contain either a single or several parasites (L. Panisset, "Trypanosoma," *Revue Générale de Médecine Vétérinaire*, vol. iv., 1904, p. 589). The *P. bigeminum* of the ox measures 2½ microns by 0·8 microns, to 1·20 microns in the flagellated, or 1 to 2 microns diameter in the circular form. In addition to these typical forms, the *P. bigeminum* of Koch, Theiler has shown that in cattle suffering from East Coast fever or Rhodesian redwater there are bacilliform parasites, *P. parvum* of Laveran (A. Laveran, "Bacilliform Piroplasmosis in Cattle," *Revue Générale de Médecine Vétérinaire*, vol. i., 1903, p. 575). In the disease in the Transcaucasus, the same has been observed by Dschunkowsky and Luhs. Theiler has shown that in the immune ox, in which the blood is still virulent, that

the piroplasma assumes a different form to what it has when the animal is ill, viz., rings or rods, with or without flagella. The resemblance to the *P. parvum* has frequently given rise to mistakes.

Morphologically, the *P. bigeminum* and *P. parvum* are difficult to distinguish, and it is only by other characteristics that the two species can be differentiated. The bacilli form differs clinically from that of Texan fever in the rarity of hæmoglobinuria, in its not being transmissible by inoculation with blood, contrary to the other species, and the fact that cattle that have resisted Texas fever often die from the Rhodesian.

The *P. ovis* and *P. equi* are very minute, 1 to 1·50 microns in diameter being the usual size. The *P. canis*, 2 to 3·5 microns, at the onset are spherical, and later on assume the pyriform shape. Four, eight, and sometimes sixteen parasites are found in a single globule.

The piroplasma multiplies by direct division (bipartition or quadripartition) of the parent cell. Nocard and Motas have failed to cultivate it, but Lignières has succeeded with the *P. bigeminum* in defibrinated blood.

The different forms of piroplasma, in spite of their resemblance, are strictly limited in their action to a particular animal or animals; thus the *P. ovis* is harmless to the dog, horse, and ox, and the *P. canis* will only affect the dog.

Etiology and Action of Ticks.—Smith and Kilborne first discovered the part played by ticks in the spread of piroplasmosis, and this has been confirmed by Pound, Koch, Lignières, Kossel (in the ox), Loundsbury (in the dog), and Motas (in the sheep).

Mégnin, "On the *Rôle* of Ticks or Ixodes in the Propagation of Piroplasmosis," *Comptes rendus de la Société de Biologie*, No. 10, January 10, 1903, p. 4.

A. Laveran, "On the *Rôle* of Ticks in the Propagation of Piroplasmosis," *Bulletin of the Biological Society*, January 17, 1903, p. 61.

Mégnin, "On the *Rôle* of Ixodes in the Propagation of Piroplasmosis," *Bulletin de la Société de Biologie*, January 31, 1903, p. 117; *Revue Générale de Médecine Vétérinaire*, vol. i., 1903, pp. 212, 213.

Motas, "On the *Rôle* of Ticks in the Propagation of Ovine Piroplasmosis (Carceag)," *Bulletin de la Société de Biologie*, April 25, 1903, p. 501; *Revue Générale de Médecine Vétérinaire*, vol. ii., 1903, p. 67.

Heronimus, "The Tick Theory of Bovine Piroplasmosis," *First Congress of Russian Veterinary Surgeons*, vol. ii., 1907; *Revue Générale de Médecine Vétérinaire*, vol. iii., 1904, p. 660.

In cattle, piroplasmosis is propagated by various species of ticks inhabiting different regions; *Boophilus bovis* (Texas fever and tristeza), *Rhipicephalus annulatus* (South Africa), *B. australis* (Philippines), *R. evertsi, appendiculatus* and *simus* (Rhodesia), *Ixodes hexagonus* and *reduvius*, (Germany, France, and Finland). Canine piroplasmosis is transmitted by the *Dermacentor reticulatus* (France) and *Hæmophysalis leachi* (South Africa).

Motas has found on infected sheep in Roumania ticks that resemble the *R. bursa;* and in South Africa the *Amblyomma hebræum* is looked upon as the active agent. Theiler has found the *R. decoloratus* and *evertsi* and *Hyalomma ægyptium* in horses suffering from piroplasmosis in the Transvaal.

The ticks fix themselves on animals affected with piroplasmosis,

and engorge themselves with blood, when they detach themselves and lay their eggs; all the intermediate stages—larva, nympha and adult—being virulent. On escaping from the egg the larva seeks the host on which it completes its evolution, or on which at all events it remains up to the nymphal stage, as its development into an adult only takes place in ticks on a second host. It is the progeny of infected mothers that most commonly propagate the disease. The disease is more severe where it arises by infection from a tick than through direct inoculation with the blood, so it is to be presumed that the organism undergoes some change in the body of the tick. In time infected ticks lose their virulent properties, but as regards bovine piroplasmosis, Kossel has seen them retain it for over a year.

The tick does not fulfil its function until the different phases of its evolution are complete, and to accomplish this certain conditions of heat and moisture are necessary, and this, together with the conditions of life of susceptible animals, explains the appearance of the disease at regular seasons, as, for instance, in America during the heat of the the summer, in sporting dogs at the opening of the shooting season, and in sheep in Roumania in May and November.

Diagnosis.—In affected regions the appearance of hæmoglobinuria, with a rise in the temperature, is of itself sufficient to indicate bovine piroplasmosis (Dr. Jong, "Notes on Piroplasmosis in Holland," *Revue Générale de Médecine Vétérinaire*, vol. vi., 1905, p. 80). In the sheep the suspicious symptoms are hæmoglobinuria and jaundice, which rapidly develop and assume an enzootic character. Nocard ("On the Prevalence of Canine Piroplasmosis in France," *Bulletin de la Société Générale de Médecine Vétérinaire*, December, 1902, p. 716, and *Revue Générale de Médecine Vétérinaire*, vol. i., 1903, p. 90) describes the characteristic symptoms in the dog. It is only by the discovery of the parasite that a positive diagnosis can be given, and it may be necessary to examine a number of specimens for several days running, as the parasites are often but few in number. In addition to these precautions, which are applicable to all forms of the disease, with regard to the dog, Nocard says: "Even if the blood is examined for several days running with negative results, it must not be taken for granted that the case is not one of piroplasmosis, for if a puppy is inoculated with a few cubic centimetres of the blood of the infected animal, in the majority of cases he will develop acute piroplasmosis, which is fatal in a very few days, and the blood of the infected animal will be found to contain endoglobular parasites" (Szoyka, "Piroplasmosis and hæmoglobinuria in the Dog," *Allatovors's Lapok*, January 1, 1903, p. 1; *Revue Générale de Médecine Vétérinaire*, vol. i., 1903, p. 216).

Treatment.—There is no known specific; quinine, which is so for malaria, being quite inert. Krägerud has suggested intravenous injection of artificial serum, also protargol or formalin, and carbolic acid by the mouth. Evers has suggested the subcutaneous injection of hæmoglobin. Hutcheon has used quinine, and Robertson quinine and calomel, Nocard and Motas arsenic and quinine, but none of these drugs have given very satisfactory results.

Prophylaxis.—Treatment being a failure, attention has been turned to preventive measures, either by the extermination of the ticks or by various processes of immunisation. In countries where stock raising is carried on on a large scale, such as the Argentine Republic and

Australia, the campaign against ticks is exceedingly difficult to carry out, as the evacuation of the pasturage disorganises the routine of the country. In most European countries, however, the infected areas can be cleared of cattle, and if this is strictly carried out they become clean in about eighteen months. Universal slaughter of all cattle in the infected zones and the stoppage of fresh importations is an effectual method of cleaning pasture. These methods, however, are expensive and irksome, and parasiticide steps have been more generally used. Krägerud and Evers recommend salt and water (Evers, "The Rational Treatment of Hæmaturia (Piroplasmosis) in Cattle," *Berliner tier Arztliche Wochenschrift*, December 24, 1903, p. 793; *Revue Générale de Médecine Vétérinaire*, vol. iv., 1904, p. 426), but Theiler and Stockman have been unsuccessful with antiseptic sprays. This plan does not destroy all the ticks, and other animals besides bovines are hosts. Theiler considers this method to be dangerous, as the use of these dips is likely to spread the disease to healthy herds. In enclosed countries cattle will escape if the ticks are carefully removed, and they are kept in the house or yards. Sporting dogs that are particularly liable to be infected with ticks are extremely difficult to keep alive, in spite of careful washing. With cattle the danger is increased from the way the disease is spread by the importation of infected animals. Quarantine and inspection of imported animals for ticks is useless. Total prohibition of all importation is the only effective means of checking the spread of the disease (Bird, "Quarantine in Texan Fever," *Revue Générale de Médecine Vétérinaire*, vol. iii., 1904, p. 84).

Immunisation.—An animal that recovers from an attack enjoys immunity, although its blood is virulent for clean ones. Kossel, Schutz, Weber and Miessner put the period this lasts at five hundred and thirty-one days, and if the animal is attacked with certain other microbian diseases the piroplasm reappears in the blood. Nicolle and Adil Bey have seen this in cattle plague, but according to Theiler the bovine *P. parvum* is an exception to this rule. The same thing is seen in canine piroplasmosis (Theiler, "Immunity in Canine Piroplasmosis"). In subjects in which the infection is latent there is considerable resistance to fatal doses of virulent blood or tick inoculation, and it seems possible experimentally to be able to vaccinate against piroplasmosis, and with cattle there are two methods, viz.:—

(1) Advantage is taken of the powers of resistance that young animals enjoy, and they are inoculated with from 1 to 10 cc. of blood from refractory animals. The process, however, is not satisfactory, as frequently the powers of resistance are small, and the animal dies from an acute attack (Schutz, "Inoculation for Hæmoglobinuria in the Ox, 1903," *Revue Générale de Médecine Vétérinaire*, vol. vi., p. 79). Schutz used blood from calves that had recovered eighty-three days at the least.

Better results have been obtained by transferring ticks to the animal, at first from 25 to 50, increasing the number to 200 to 400. Koch, for East Coast fever, recommends successive doses of 10 cc. of defibrinated blood from animals that have recovered; he later on modified his plan, and used 5 cc. doses every fifteen days for five consecutive months, but this method, which has been studied by Robertson, Theiler, Stockman (Theiler and Stockman, "Observations on

Tropical Piroplasmosis, East Coast Fever, or Rhodesian Red Water," *Revue Générale de Médecine Vétérinaire*, vol. iv., 1904, pp. 348 and 393) and Gray (Gray and Robertson, " Report on Texan Fever, or Red-water in Rhodesia," *Veterinary Journal*, March, 1903), and in their hands the results have not been successful; in fact, all these plans of inoculation are powerless to protect animals, even if they are not absolutely dangerous.

(2) *Vaccination with Attenuated Virus.*—Lignières (" Bovine Piroplasmosis; Observations regarding the Multiplication of the Parasite, its Evolution, Natural Transmission, and Prevention by Vaccination," *Archives de Parasitologie*, August 20, 1903; *Revue Générale de Médecine Vétérinaire*, vol. iii., 1904, p. 659), has used a virus attenuated by some process that has not been made public. The value of this process has been demonstrated by Nocard at Buenos Aires and Alfort, the subjects that were vaccinated standing an inoculation either by injection or by ticks that killed controls. The plan is, however, still imperfect for practical purposes, as animals that are rendered immune in one locality will die when removed to another, and this difficulty will only be overcome with a polyvalent vaccine.

The results obtained regarding vaccination against ovine and canine piroplasmosis are not encouraging, but in some experiments that Motas has made with sheep with a combination of bile and virulent blood there is more hope of success.

With the dog, Nocard and Motas have completely failed in their attempts to find an attenuated virus.

Serotherapy.—At present but little is known regarding the protective properties of serum from animals that have recovered from an attack, but Koch claims to have obtained a protective serum in African coast fever, but in South Africa it has not been very effective, as animals that are immune to coast fever die from Texan.

Nocard and Motas have obtained one from the dog that has protective properties in from 3 to 5 cc. doses.

In the present state of our knowledge, Lignières' polyvalent serum seems to be the most hopeful, but no known plan is absolutely certain as free from danger.

(*Revue Générale de Médecine Vétérinaire.*)

STRYCHNINE POISONING.

BY BOCK.

THE author recommends the following formula when it is desired to destroy a horse with strychnine. He uses a solution in glycerine in which it is much more soluble than in water, viz., forty-five times its weight of the former to ninety of the latter, 10 grammes of the solution containing 40 centigrammes of strychnine, and he finds that this quantity is ample if injected into the jugular with an ordinary Pravaz syringe. Death takes place instantaneously (three to four seconds), and there are not the distressing spasms seen as is the case when the aqueous solution is used.

(*Zeitschrift für Veterinärkunde.*)

CASE OF MERCURIAL POISONING IN THE HORSE.

BY FRÖHNER.

THE animal, which was aged about 10, was dressed by the owner over the ribs, back and quarters with blue mercury ointment for some skin complaint. Seven days afterwards he went off his feed, diarrhœa and a profuse nasal discharge set in, with weakness and loss of appetite. The general condition was bad, the hair standing on end. Temperature 39·2° C., pulse weak and 68 per minute. Over the parts where the ointment had been applied pustules about the size of a shilling had formed. The diarrhœa became worse and very fœtid, and the nasal discharge increased in quantity, the mucous membranes became dark in colour and covered over with petechia. The debility and depression were extreme, and the sensations dulled. The animal died on the ninth day.

Post-mortem Appearances.—There was inflammation of the mucous membrane lining the stomach, hæmorrhagic enteritis of the anterior portion of the small intestine, necrosis and perforation of the cæcum, purulent sero-fibrinous peritonitis, catarrhal nephritis, and acute inflammation of the spleen.

(*Monatschefte für praktische Thierheilkunde.*)

Letters and Communications, &c.

Mr. W. C. Patrick; Mr. T. A. Frost; Mr. H. E. T. Mason; Professor Dunn; Colonel Nunn; Mr. H. B. Eve.

Books and Periodicals, &c., Received.

Board of Agriculture and Fisheries; American Veterinary Review; Journal of the Royal Army Medical Corps; Report of the Chief Veterinary Officer for New Zealand; "Horses, their Points and Management in Health and Disease," by F. T. Barton; Transactions of the Royal Society, Edinburgh; Department of Agriculture and Technical Instruction for Ireland; The Tropical Agriculturist; Report of the Government Bacteriologist of Natal.

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